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NEMERTEANS FROM THE SOUTH ATLANTIC AND SOUTHERN OCEANS

By

J. F. G. WHEELER, D.Sc.

Bermuda Biological Station for Research, Inc.

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(Plates XV, XVI; text-figs. 1–66)

INTRODUCTION

A LARGE number of the Nemerteans described in this report were examined alive directly after capture, and whenever opportunity occurred they were sketched to show form and colour. This applies particularly to the littoral species from Saldanha Bay, South Africa, and King Edward Cove, South Georgia, where I was engaged on whaling investigations as a member of the Discovery Committee's scientific staff at different periods from 1925 to 1931. Many other specimens were collected in the nets of the R.R.S. 'Discovery', R.R.S. 'Discovery II', and R.S.S. 'William Scoresby' in the course of the investigations. Other members of the staff found time to make sketches of unusual forms, although opportunities were far less frequent at sea, and on most occasions a note of the colour and markings had to suffice.

I wish to express my thanks to Dr Kemp, Director of Research, for his interest and for allowing me to work on the group, to my former colleagues who took especial care in the collection of specimens, and to Professor D. M. S. Watson, who very kindly placed a room and the facilities of his department at my disposal for the completion of the work. That this has been accomplished I owe to my wife who prepared the hundreds of sections—those necessary for comparison with the observations of other workers and those to complete our knowledge of particular species and to make the fullest possible use of the collection.

METHODS

The frequent collections of Nemerteans at South Georgia and from the whaling station at Saldanha Bay were not recorded under station numbers. Most of them were shore collections made in the interval between other work. The dates on which they were made are included in the systematic account. At South Georgia a kelp grapnel made of three shark hooks lashed together was used for tearing kelp roots from the bottom. This was found to be a more efficacious method of capturing undamaged specimens than the dredge or small trawl. The worms collected at sea were taken in a variety of nets to which a key is given below.

The animals sketched and noted in life were preserved and numbered N 1, N 2, N 3

and so on, for work later, since there was little time for section cutting and no opportunity for consulting the literature of the group. The ultimate preserving fluid was 75 per cent alcohol for nearly all specimens, but I found that fixation in Da Fano 1 (cobalt nitrate and formalin—see Lee, 1928, p. 348) and subsequent preservation in 5 per cent formalin worked well with *Lineus corrugatus*, especially the large red-brown form, which does not bleach as readily with this treatment as it does in spirit. Chloral hydrate was the usual anaesthetic. The crystals were added to the sea water in the Petri dish containing the specimen. I found that small forms could be dealt with by sucking them into a glass tube rather smaller in bore than their diameter and holding the tube under hot water running from a tap. When the worms were blown out of the tube into the fixing fluid they contracted very little and not only kept fairly straight but often left their protective mucous coat in the tube and thus facilitated the subsequent examination in cedar oil for deeply embedded eyespots. Bouin and Bouin Duboscq were frequently used as fixing reagents. Corrosive sublimate both hot and cold was tried but was not successful. On one occasion large specimens of *Lineus corrugatus* were immobilized by the natural freezing of the surface layer in the basin left overnight outside the station at South Georgia. The animals were by no means dead although they were at first completely insensitive. As mentioned later in the notes on this species, the slackened musculature of the semi-frozen animals threw light on differences that had been noticed in the body form of preserved specimens.

When the material from the ships was being worked over the numbered series was continued, since very few of the specimens could be identified at sight; and it was used throughout in the numbering of the serial sections. The slides were marked with a diamond N 1, N 2, N 3 and so on, in addition to the serial number in each particular series, and the number was, of course, added to the label replaced with the remainder of the specimen.

The pelagic forms were fixed and preserved in 5 per cent formalin. Before sections were cut the preserved specimens were measured and examined for form, colour and markings. Eyespots were sought for by clearing in cedar or anilin oil. In the armed species the armature was especially looked for, and variations in the number of stylets noted.

Identification with previously described species has, however, not been an easy matter, for variations occur in certain characters that have been used for specific determination, for instance, in the number of nerves in the proboscis and the size of the armature. The state of contraction of the body affects the relative thickness of the body layers and the course of the lateral nerves when they leave the brain. Even the shape of the brain and the position of the organs in relation to it can vary from this cause, though I do not know to what extent. Body form and colour vary considerably in some forms, the outstanding example being *L. corrugatus*, which appears to be the *L. ruber* of the south, judging by the colour differences between individuals that it exhibits when alive and the changes in body form that take place on fixation. If there are difficulties of identification with live animals there are greater difficulties with preserved specimens

whose life form and colour are unknown. Only by combining colour sketches and observation in life with anatomical work can the identification of the Nemerteans be made with any degree of certainty.

The complete discontinuity of the African and Falkland sector Nemertean faunas is reflected in this report by treatment in separate sections. It is indeed a striking fact that this discontinuity should be so complete, for the predominant form of the south—*L. corrugatus*—was first collected at Kerguelen, and it might naturally be expected to appear in the fauna of the southern extremity of Africa. Instead there has been found an extension of the Mediterranean fauna to the southern hemisphere as far as Saldanha Bay. This was foreshadowed by the capture of *Carinella annulata* in Simon's Bay near Cape Town, reported by Stimpson in 1856, and it suggests that the littoral Nemerteans depend upon the continuity of land rather than upon ocean currents for their dispersal.

The pelagic forms fall naturally into a separate group on account of their structural peculiarities. Some of these, such as their general transparency and expanded leaf-like form, can be considered as adaptations to their mode of life; but the anomalous position of the male generative organs and the sexual dimorphism exhibited by forms like *Nectonemertes* must be due to deeper causes. The work of Brinkmann on the pelagic forms shows how close is their relationship with the Drepanophoridae and it is curious that this small family, alone among Nemerteans, should have taken to the pelagic habit.

The synonymy of most of the known forms has been thoroughly worked out by Bürger in his magnificent Naples monograph (1895) and in his section (Nemertini, 1904) of *Das Tierreich*. Synonymies are only given in the following report where fresh data warrant a revised opinion on the relationship of previously described species. I have followed Coe (1905) in uniting the Protonemertini and Mesonemertini of Bürger under the order Paleonemertea, and in retaining Hubrecht's order Hoplonemertea for the armed species instead of Metanemertini. The names are less unwieldy than those proposed by Poche (1926). The further division of the Hoplonemertea into Monostilifera and Polystilifera (Brinkmann, 1917) is adopted.

LIST OF STATIONS AT WHICH NEMERTEANS WERE COLLECTED, WITH THE SPECIES OBTAINED

In the list of stations the following symbols represent the various kinds of gear used:

B	Oblique.
BTS	Small beam trawl. Beam 8 ft. in length (2·45 m.): mesh at cod-end $\frac{1}{2}$ in. (12·5 mm.).
DL	Large dredge. Light pattern, 4 ft. in length (1·2 m.).
DS	Large dredge. Heavy pattern, 4 ft. in length (1·2 m.).
N 4–T	Small dredge.
H	Horizontal.
DLH N 7–T	Nets with mesh of 4 or 7 mm. (0·16 or 0·28 in.) attached to back of trawl.
N 70	70 cm. tow-net. Mouth circular, 70 cm. in diameter (27·5 in.): mesh graded, at cod-end 74 to the linear inch.

N 100 1 m. tow-net. Mouth circular, 1 m. in diameter (3·3 ft.): mesh graded. Cod-end of stramin with 11–12 meshes to the linear inch.
N 200 2 m. tow-net. Mouth circular, 2 m. in diameter (6·6 ft.): mesh graded, at cod-end 4 mm. (0·16 in.).
N 450 $4\frac{1}{2}$ m. tow-net. Mouth circular, $4\frac{1}{2}$ m. in diameter (14·8 ft.): mesh graded, at cod-end 7 mm. (0·28 in.).
NCS–T Tow-net of coarse silk, with 16 meshes to the linear inch, attached to trawl.
NH Hand net.
NRL Large rectangular net. Frame 8 ft. long and $2\frac{1}{4}$ ft. wide (2·45 m. × 0·7 m.) with bag of $\frac{1}{2}$ in. mesh (12·5 mm.).
OTC Commercial otter trawl. Head rope 80 ft. long (24·5 m.): mesh at cod-end $1\frac{1}{2}$ in. (3·8 cm.).
OTL Large otter trawl. Head rope 40 ft. long (12·2 m.): mesh at cod-end $1\frac{1}{4}$ in. (3·2 cm.).
OTM Medium otter trawl. Head rope 30 ft. long (9·14 m.): mesh at cod-end $1\frac{1}{4}$ in. (3·2 cm.).
RM Mussel rake
Sh. coll. Shore collection.
TYF Young-fish trawl. Mouth about 20 ft. in circumference (6 m.): bag of stramin with 11–12 meshes to the linear inch.
V Vertical.

R.R.S. 'DISCOVERY' AND R.R.S. 'DISCOVERY II'

2. xi. 25. 6° 55′ N, 15° 54′ W. N 200, 0–800 m.

Pelagonemertes rollestoni, Moseley. *Nectonemertes kempi*, n.sp.
Crassonemertes robusta, Brinkmann.

St. 4. 30. i. 26. Tristan da Cunha, 36° 55′ S, 12° 12′ W. DL, 40–46 m.

Cerebratulus fuscus, McIntosh.

St. 27. 15. iii. 26. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Light. DL, 110 m.

Amphiporus lecointei, Bürger.

St. 39. 25. iii. 26. East Cumberland Bay, South Georgia, from 8 cables S 81° W of Merton Rock to 1·3 miles N 7° E of Macmahon Rock. OTL, 179–235 m.

Amphiporus spinosus, Bürger. *Lineus corrugatus*, McIntosh.

N 4–T, 179–235 m.

Tetrastemma esbenseni, n.sp.

St. 42. 1. iv. 26. Off mouth of Cumberland Bay, South Georgia, from 6·3 miles N 89° E of Jason Light to 4 miles N 39° E of Jason Light. OTL, 120–204 m.

Tetrastemma longistriatum, n.sp.

St. 45. 6. iv. 26. 2·7 miles S 85° E of Jason Light, South Georgia. OTL, 238–270 m.

Amphiporus spinosus, Bürger. *Lineus corrugatus*, McIntosh.

St. 51. 4. v. 26. Off Eddystone Rock, East Falkland Island, from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock. OTL, 105–115 m.

Tetrastemma georgianum, Bürger. *Lineus corrugatus*, McIntosh.

St. 53. 12. v. 26. Port Stanley, East Falkland Island, Hulk of 'Great Britain'. RM, 0–2 m.

Tetrastemma hansi, Bürger. *Lineus corrugatus*, McIntosh.

St. 71. 30. v. 26. 43° 20′ S, 46° 02′ W. N 70 V, 1000–750 m. TYF, 2000 (–0) m.
Pelagonemertes rollestoni, Moseley.

St. 72. 1. vi. 26. 41° 43′ 20″ S, 42° 20′ 40″ W. N 450, 2000 (–0) m.
Pelagonemertes rollestoni, Moseley.

St. 76. 5. vi. 26. 39° 50′ 30″ S, 36° 23′ W. N 450, 1500 (–0) m.
Pelagonemertes rollestoni, Moseley.

St. 78. 12. vi. 26. 35° 18′ S, 19° 01′ 10″ W. TYF, 1000 (–0) m.
Pelagonemertes rollestoni, Moseley.

St. 79. 13. vi. 26. 34° 48′ S, 16° 36′ W. N 450, 1000–0 m.
Pelagonemertes rollestoni, Moseley.

St. 85. 23. vi. 26. 33° 07′ 40″ S, 4° 30′ 20″ E. N 450, 2000 (–0) m.
Bathynemertes hubrechti, Brinkmann. *Pelagonemertes rollestoni*, Moseley.

St. 86. 24. vi. 26. 33° 25′ S, 6° 31′ E. N 450, 1000 (–0) m.
Bathynemertes hardyi, n.sp. *Pelagonemertes rollestoni*, Moseley.

St. 87. 25. vi. 26. 33° 53′ 45″ S, 9° 26′ 30″ E. TYF, 1000 (–0) m.
Nectonemertes mirabilis, Verrill.

St. 89. 28. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. TYF, 1000 (–0) m.
Bathynemertes hubrechti, Brinkmann. *Probalaenanemertes irenae*, n.sp.
Pelagonemertes rollestoni, Moseley.

St. 100*c*. 4. x. 26. 33° 20′ to 33° 46′ S, 15° 18′ to 15° 08′ E. TYF, 2500 (–0) m.
Bathynemertes hubrechti, Brinkmann.

St. 101. 14. x. 26. 33° 50′ to 34° 13′ S, 16° 04′ to 15° 49′ E. N 450, 1310–1410 m.
Bathynemertes hubrechti, Brinkmann.

St. 107. 4. xi. 26. 45° 03′ S, 17° 03′ E. N 450, 850–950 m.
Pelagonemertes rollestoni, Moseley.

St. 123. 15. xii. 26. Off mouth of Cumberland Bay, South Georgia, from 4·1 miles N 54° E of Larsen Point, to 1·2 miles S 62° W of Merton Rock. OTL, 230–250 m.
Amphiporus moseleyi, Hubrecht. *T. georgianum*, Bürger.
A. spinosus, Bürger. *Parapolia grytvikenensis*, n.sp.
Tetrastemma esbenseni, n.sp. *Lineus corrugatus*, McIntosh.

St. 140. 23. xii. 26. Stromness Harbour to Larsen Point, South Georgia, from 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W. OTL, 122–136 m.
Amphiporus lecointei, Bürger. *Tetrastemma georgianum*, Bürger.
A. spinosus, Bürger. *Cerebratulus larseni*, n.sp.

St. 141. 29. xii. 26. East Cumberland Bay, South Georgia, 200 yards from shore, under Mount Duse. BTS, 17–27 m.
Tetrastemma longistriatum, n.sp.

St. 144. 5. i. 27. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W. NCS–T, 155–178 m.
Tetrastemma gulliveri, Bürger.

St. 156. 20. i. 27. 53° 51′ S, 36° 21′ 30″ W. DLH, 200–236 m.

Amphiporus lecointei, Bürger.

St. 158. 21. i. 27. 53° 48′ 30″ S, 35° 57′ W. DLH, 401 m.

Amphiporus lecointei, Bürger.

St. 159. 21. i. 27. 53° 52′ 30″ S, 36° 08′ W. DLH, 160 m.

Amphiporus lecointei, Bürger.

St. 160. 7. ii. 27. Near Shag Rocks, 53° 43′ 40″ S, 40° 57′ W. DLH, 177 m.

Tetrastemma weddelli, n.sp. *Lineus corrugatus*, McIntosh.

St. 163. 17. ii. 27. Paul Harbour, Signy Island, South Orkneys. BTS, 18–27 m.

Tetrastemma longistriatum, n.sp. *Lineus corrugatus*, McIntosh.

St. 164. 18. ii. 27. East end of Normanna Strait, South Orkneys, near Cape Hansen, Coronation Island. BTS, 24–36 m.

Lineus corrugatus, McIntosh.

St. 167. 20. ii. 27. Off Signy Island, South Orkneys, 60° 50′ 30″ S, 46° 15′ W. N 4–T and N 7–T, 244–344 m.

Lineus longifissus, Hubrecht. *L. corrugatus*, McIntosh.

St. 173. 28. ii. 27. Port Foster, Deception Island, South Shetlands, close to SE shore, near Lake Point. BTS, 5–60 m.

Lineus corrugatus, McIntosh.

St. 175. 2. iii. 27. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W. DLH, 200 m.

Tetrastemma validum, Bürger.

St. 179. 10. iii. 27. Melchior Island, Schollaert Channel, Palmer Archipelago, in creek to S of SW anchorage. DS, 4–10 m.

Tetrastemma validum, Bürger.

St. 182. 14. iii. 27. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W. N 7–T, 278–500 m.

Amphiporus schollaerti, n.sp. *Bascodiscus antarcticus*, Baylis.

St. 186. 16. iii. 27. Fournier Bay, Anvers Island, Palmer Archipelago, 64° 25′ 30″ S, 63° 02′ W. DLH, 295 m.

Lineus corrugatus, McIntosh.

St. 195. 30. iii. 27. Admiralty Bay, King George Island, South Shetlands, 62° 07′ S, 58° 28′ 30″ W. OTM, 391 m.

Amphiporus lecointei, Bürger. *Lineus corrugatus*, McIntosh.

St. 256. 23. vi. 27. 35° 14′ S, 6° 49′ E. TYF, 850–1100 (–0) m.

Pelagonemertes rollestoni, Moseley.

St. 283. 14. viii. 27. Off Annobon, Gulf of Guinea, 0·75 to 1 mile N 12° E of Pyramid Rock, Annobon. DLH, 18–30 m.

Lineus geniculatus (Chiaje).

St. 395. 13. v. 30. 48° 26¾′ S, 22° 10′ W to 48° 26½′ S, 22° 06½′ W. N 450 H, 1500–1600 m.

Pelagonemertes rollestoni, Moseley.

St. 405. 4. vi. 30. 33° 50½′ S, 15° 46′ E to 34° 16′ S, 15° 02′ E. TYFB, 2200–0 m.

Pelagonemertes rollestoni, Moseley.

R.R.S. 'WILLIAM SCORESBY'

St. WS 4. 30. ix. 26. 32° 45′ S, 18° 10′ E. DL, 45–47 m.

Nemertopsis tenuis, Bürger.

St. WS 25. 17. xii. 26. Undine Harbour (North), South Georgia. BTS, 18–27 m.

Amphiporus lecointei, Bürger.
Lineus corrugatus, McIntosh.

St. WS 56. 14. i. 27. Larsen Harbour, Drygalski Fjord, South Georgia. NH, 2 m.

Amphiporus spinosus, Bürger.
Lineus corrugatus, McIntosh.

St. WS 62. 19. i. 27. Wilson Harbour, South Georgia. BTS, 26–83 m.

Amphiporus spinosus, Bürger.
Lineus corrugatus, McIntosh.

St. WS 65. 22. i. 27. Undine Harbour (North), South Georgia. Sh. coll.

Amphiporus spinosus, Bürger.

St. WS 73. 6. iii. 27. 51° 01′ S, 58° 54′ W, from 51° 02′ S, 58° 55′ W to 51° 00′ S, 58° 53′ W. OTC, 121–130 m.

Baseodiscus antarcticus, Baylis
Amphiporus spinosus, Bürger.
Lineus corrugatus, McIntosh.
Cerebratulus malvini, n.sp.

St. WS 77. 12. iii. 27. 51° 01′ S, 66° 31′ 30″ W, from 51° 00′ S, 66° 30′ W to 51° 02′ S, 66° 33′ W. OTC, 110–113 m.

Lineus corrugatus, McIntosh.

St. WS 79. 13. iii. 27. 51° 01′ 30″ S, 64° 59′ 30″ W, from 51° 00′ S, 65° 00′ W to 51° 03′ S, 64° 59′ W. OTC, 132–131 m.

Lineus corrugatus, McIntosh.

St. WS 80. 14. iii. 27. 50° 57′ S, 63° 37′ 30″ W, from 50° 58′ S, 63° 39′ W to 50° 55′ 30″ S, 63° 36′ W. OTC, 152–156 m.

Lineus corrugatus, McIntosh.

St. WS 84. 24. iii. 27. 7½ miles S 9° W of Sea Lion Island, East Falkland Island, from 52° 33′ S, 59° 08′ W to 52° 34′ 30″ S, 59° 11′ W. OTC, 75–74 m.

Lineus corrugatus, McIntosh.
Amphiporus falklandicus, n.sp.

St. WS 88. 6. iv. 27. 54° 00′ S, 64° 57′ 30″ W, from 54° 00′ S, 65° 00′ W to 54° 00′ S, 64° 55′ W. OTC, 118 m.

Lineus corrugatus, McIntosh.

St. WS 93. 9. iv. 27. 7 miles S 80° W of Beaver Island, West Falkland Island, from 51° 51′ S, 61° 30′ W to 51° 54′ S, 61° 30′ W. N 7–T, 133–130 m.

Amphiporus lecointei, Bürger.

St. WS 97. 18. iv. 27. 49° 00′ 30″ S, 61° 58′ W, from 49° 00′ S, 62° 00′ W to 49° 01′ S, 61° 56′ W. OTC, 146–145 m.

Amphiporus falklandicus, n.sp.

St. WS 219. 3. vi. 28. 40° 06′ S, 62° 12′ W. NCS–T, 116–114 m.

Amphiporus moseleyi, Hubrecht.

St. WS 225. 9. vi. 28. 50° 20′ S, 62° 30′ W. OTC, 162–161 m.

Amphiporus falklandicus, n.sp.
A. gerlachei, Bürger.
Lineus corrugatus, McIntosh.

St. WS 228. 30. vi. 28. 50° 50′ S, 56° 58′ W. OTC, 229–236 m.

Amphiporus falklandicus, n.sp
Lineus corrugatus, McIntosh.
Cerebratulus malvini, n.sp.

NCS–T, 229–236 m.

Lineus corrugatus, McIntosh.

N 4–T, 229–236 m.

Lineus corrugatus, McIntosh.

St. WS 231. 4. vii. 28. 50° 10′ S, 58° 42′ W. NCS–T, 167–159 m.

Amphiporus inexpectatus, n.sp.

St. WS 237. 7. vii. 28. 46° 00′ S, 60° 05′ W. NCS–T, 148–256 m.

Lineus corrugatus, McIntosh.

St. WS 239. 15. vii. 28. 51° 10′ S, 62° 10′ W. OTC, 196–193 m.

Cerebratulus malvini, n.sp.

St. WS 246. 19. vii. 28. 52° 25′ S, 61° 00′ W. OTC, 267–208 m.

Amphiporus falklandicus, n.sp.
A. gerlachei, Bürger.
Cerebratulus malvini, n.sp.
Lineus corrugatus, McIntosh.

St. WS 248. 20. vii. 28. 52° 40′ S, 58° 30′ W. OTC, 210–242 m.

Amphiporus falklandicus, n.sp.
Lineus corrugatus, McIntosh.

St. WS 249. 20. vii. 28. 52° 10′ S, 57° 30′ W. DLH, 166 m.

Amphiporus gerlachei, Bürger.
Lineus corrugatus, McIntosh.
Cerebratulus malvini, n.sp.

St. WS 302. 6. x. 28. 54° 57′ 20″ S, 31° 49′ 35″ W. N 70 B, 98–0 m.

Amphiporus scoresbyi, n.sp.

St. WS 548. 31. i. 31. 64° 07′ S, 15° 38′ W. N 100 B, 106–0 m.

Amphiporus scoresbyi, n.sp.

St. WS 550. 1. ii. 31. 66° 51½′ S, 15° 24′ W. N 70 B, 121–0 m.

Amphiporus scoresbyi, n.sp.

MARINE BIOLOGICAL STATION, SOUTH GEORGIA

St. MS 67. 28. ii. 26. East Cumberland Bay, 3 cables NE of Hobart Rock to ½ cable W of Hope Point. BTS, 38 m.

Tetrastemma gulliveri, Bürger.
Amphiporus moseleyi, Hubrecht.

St. MS 68. 2. iii. 26. East Cumberland Bay, 1·7 miles S ½ E to 8½ cables SE × E of Sappho Point. NRL, 220–247 m.

Amphiporus spinosus, Bürger.
Lineus corrugatus, McIntosh.

St. MS 70. 9. iii. 26. Maiviken, West Cumberland Bay. Sh. coll.

Tetrastemma esbenseni, n.sp. *T. maivikenensis*, n.sp.

St MS 71. 9. iii. 26. East Cumberland Bay, $9\frac{1}{4}$ cables E × S to 1·2 miles E × S of Sappho Point. BTS, 110–60 m.

Amphiporus spinosus, Bürger.

NCS–T, 110–60 m.

Amphiporus lecointei, Bürger.

SYSTEMATIC ACCOUNT

PART I. NEMERTEANS FROM SALDANHA BAY, SOUTH AFRICA

Saldanha Bay lies on the west coast of Africa about sixty miles north of Cape Town. The bay is a shallow sandy-bottomed inlet fifteen miles long. From the narrow entrance the bay turns south nearly parallel to the outer coast from which it is separated by a ridge rising in some places into considerable hills. Dredging inside the bay was very unproductive. The Nemerteans described here were collected mainly from the roots of kelp torn from the boulders at low tide. A few were found beneath stones and others in roots and kelp tangles washed up on the beaches. Although the conditions near the two whaling stations were different from those on the outer coast there was no apparent difference in the kelp root faunas except in size. The largest specimens came from the outer coast.

Twelve species were found, eight of which were already known from the Mediterranean and coasts of northern Europe. *Tubulanus nothus* and *Cerebratulus fuscus* were the commonest species, but the yellow *Emplectonema ophiocephala* was also frequently captured. *Lineus geniculatus*, another Mediterranean form, was collected at Annobon Island in the Gulf of Guinea close on the equator. Three new species—*Zygonemertes capensis*, *Tetrastemma nigrolineatum* and *Oerstedia maculata*—are described in the following section.

The extension of range into the southern hemisphere appeared so important that every effort has been made to verify the specific identity of the animals with the previous descriptions. It is for this reason that the colour sketches of the worms in life are reproduced (Pl. XV).

Order PALEONEMERTEA

Genus Tubulanus, Renier

Tubulanus nothus, Bürger (Plate XV, figs. 1, 2; Figs. 1–4).

Carinella nothus, Bürger, 1895, p. 527, pl. 1, fig. 12.

Twenty-two specimens of this species were taken from kelp roots from the rocks between tide marks. The lengths ranged from 10 to 20 cm. The corresponding breadths were 0·6 mm. (head 1·0) and 1·0 mm. (head 1·5). One very large fragment of body

2·5 mm. broad was found. The worm to which this belonged must have been 30–40 cm. long. A thin transparent tube was sometimes secreted when the worms had been in captivity for a few hours.

Form and colour in life. The body is round in section, but it tapers and is a little flattened from above down towards the tail. The head is round in outline from above, broader than it is long, and about one and a half times as broad as the body. The proboscis pore is just ventral to the tip of the head and the mouth is a small longitudinal slit immediately behind the junction of the head and neck. There is a large laterally spread group of black pigment specks at the edge of the head on each side of the proboscis pore. The tail is somewhat bulbous; its margin is nearly transparent, and the gut, which shows through, is not swollen.

The general colour is brownish red, fading gradually to yellow at the tail. The underside is paler than the back, more so posteriorly. The shades of red vary from dusky crimson to light yellow red. The colour fades abruptly near the tip of the head and there is here a transverse white mark nearly complete ventrally to form a white ring. The first body ring occurs about the breadth of the head from its posterior end. This ring is a white chevron with its apex pointing back. It is incomplete ventrally. The rest of the body is marked by a series of white annulations also usually incomplete ventrally. The number varies from seventeen to eighty. Some of the earlier rings are complete and the larger ones are formed of two narrow bands placed close together. The interval between the third and fourth body rings is more than double the interval between any other consecutive rings. Traces of lateral longitudinal white lines are found, and sometimes there is a thin mid-dorsal line traceable after the first few rings behind the head and disappearing again at about the fortieth ring.

Form and colour of preserved specimens. On fixing shrinkage takes place, but the body retains its shape to a great extent. The head is flattened but very round in outline from above. There is a fold between head and body in which are hidden the openings of the canals of the cerebral organs (Fig. 1). Side organs are present. They appear as white marks one on each side of the body in the dark brown region behind the third white ring. The body is often somewhat swollen here. The colour of the body anteriorly is light brown on the back, paler beneath. There is a sharp transition after the second white ring to dark dirty brown which is similar dorsally and ventrally. This gradually fades and at the eleventh ring the colour is again light brown. Lateral white lines can just be seen. The patches of eyespecks are sometimes visible as a greyish blur.

Fig. 1. *Tubulanus nothus*, Bürger. Head of preserved specimen, ventral surface.

Internal structure. The epithelium is thick, especially in the oesophageal region, and contains numerous eosinophile gland cells. Near the tip of the head the distribution of these cells is unequal, there being many ventrally and few dorsally while with the pigment cells the opposite is the case. Head glands and frontal organs are not present. The mouth is evident in transverse section before the brain has disappeared (Fig. 2A). The gut is unbranched.

The vascular system is first seen in serial sections as a single relatively large lacuna, with strands of tissue passing across it vertically, lying above the commencement of the rhynchodaeum at the tip of the head. Farther back the intrusion of the rhynchodaeum causes this lacuna to be divided into two lateral and a median lacuna. The latter has a

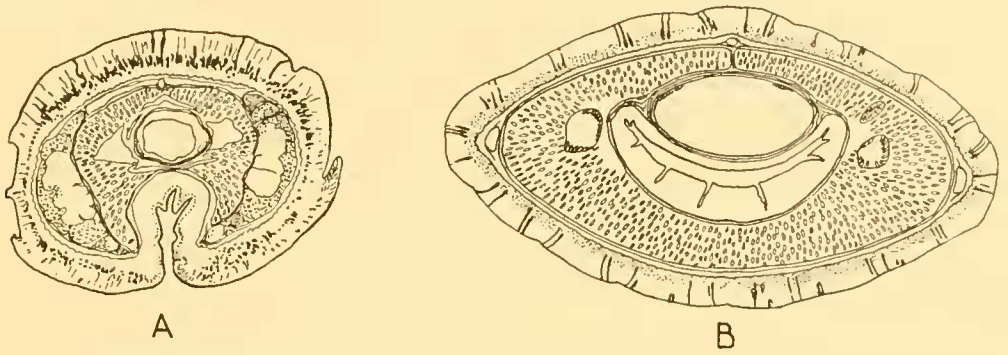

Fig. 2. *Tubulanus nothus*, Bürger. A, transverse section of head at anterior end of mouth; B, transverse section of body at nephridial canal.

narrow lumen and lies above the rhynchodaeum. Where the pharyngeal nerves leave the brain the lateral blood spaces are joined beneath the rhynchodaeum by a ventral connecting lacuna and at the same place the laterals are again united with the median dorsal. The latter shortly afterwards disappears. Immediately behind the ventral connecting blood space a pair of small vessels separate off from the laterals. These remain close to the angle of the pharynx, but at the posterior end of the mouth they rejoin the laterals. There are subsequently one or two downward extensions of the laterals forming small loops (Fig. 3). I could not trace the close connection of the vascular system with the excretory tubules described by Oudemans (1885) in *Carinella annulata*. The excretory tubules occur above the lateral vessels and open to the exterior by a single duct high up on the dorsal surface (Fig. 2B).

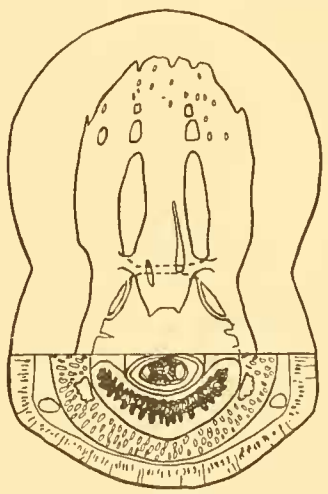

Fig. 3. *Tubulanus nothus*, Bürger. Diagram from a graphic reconstruction showing the vascular system (dorsal).

The nervous system lies between the basement membrane and the circular muscles. The brain consists of two lateral curved plates of tissue with no observed demarcation between cellular and fibrous tracts. The plates are united by a stout ventral commissure, and a little farther back by a slender dorsal commissure. There is little differentiation into dorsal and ventral ganglia until the posterior end of the brain. Anteriorly the brain breaks up into many nerves to serve the tip of the head. Just in advance of the ventral commissure a pair of nerves is given off for the proboscis. Another pair originates from the ventral ganglia after the commissure and innervates the pharynx. A mid-dorsal nerve intersects the dorsal commissure. It passes down the body between the basement mem-

brane and the muscles, and it has been traced forwards for some distance into the head. The lateral nerve stems are united by frequent commissural strands. From the transverse furrows between head and body the cerebral canals pass in on each side directly towards the brain. At the basement membrane they meet and become embedded within a nerve from the dorsal ganglion (Fig. 4). The canal just penetrates the basement membrane but cannot be traced farther.

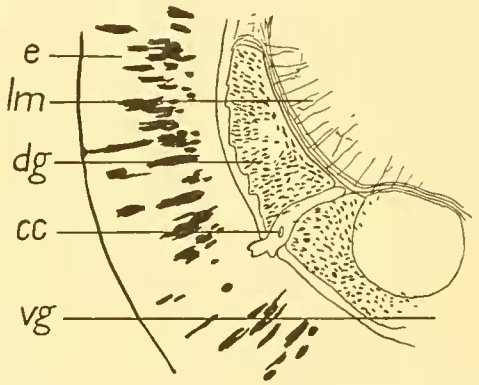

Fig. 4. *Tubulanus nothus*, Bürger. Section showing the cerebral canal entering the nerve from the dorsal ganglion. *e*, epithelium; *cc*, cerebral canal; *dg*, dorsal ganglion; *lm*, longitudinal muscles; *vg*, ventral ganglion.

These worms have been identified with *Tubulanus nothus*, described by Bürger from the Mediterranean, from the form of the head, colour of the body and the arrangement of white rings, the pigmented patches of eyespecks, the side organs, and some anatomical features such as the thickness of the epithelium and the position of the nephridial canals. The penetration of the cerebral canals beyond the basement membrane is not considered of significance. In *T. banyulensis*, whose anatomy according to Bürger (1895) is similar to that of *T. nothus*, the cerebral organ is a finger-like pit which reaches the basement membrane and is innervated from the posterior angle of the dorsal ganglion (*loc. cit.*, p. 526).

It is curious that *T. annulatus* was not taken at Saldanha Bay, for it was described by Stimpson (1856) from Simon's Bay near Cape Town.

Order HETERONEMERTEA

Genus Lineus, Sowerby

Lineus bilineatus, Renier, 1804 (Plate XV, fig. 10).

One specimen of this characteristically marked species was taken in August from a kelp root attached to a granite boulder on the outer shore near Eland Point—the end of the southern arm of the bay. The length was between 15 and 20 cm., but the specimen was damaged. The breadth of the head was 0·6 mm. Eggs were present.

Form and colour in life. The body is soft, somewhat flattened and slim. The head is not distinctly marked off from the body; it is flat, obtusely pointed and wider at half length than the anterior part of the body. The tip is slightly notched. No eyes are visible.

The colour is light brown with a double white line down the back from the tip of the head to the tip of the tail.

Form and colour of preserved specimen. In spirit the worm is white and no trace can be seen of the white lines. The cephalic slits are very long. The mouth is a small round aperture opposite the posterior ends of the cephalic slits.

No eyes could be seen after clearing in anilin oil.

Lineus geniculatus (Chiaje, 1828) (Fig. 5).

Two specimens (N 69) were taken at St. 283 off Annobon in the Gulf of Guinea. This was in August 1927. They were practically identical in size: length 27·5 cm.; breadth 0·55 cm.; thickness 0·15 cm.

Form and colour of preserved specimens. The body is very flattened, the head blunt in outline from above and the tail pointed. The mouth is a longitudinal slit 7 mm. long (Fig. 5).

The colour is brownish dorsally and ventrally with complete white annulations—fifty-three in one specimen, fifty-six in the other. I could find no trace of longitudinal markings and no sign of eyes: but of the latter eighty-eight were afterwards counted in the sections embedded in the tissue of the head at the edges of the cephalic slits. They were most numerous at the tip of the head but occurred as far back as the brain.

The head glands stain markedly with haematoxylin. They are scattered in two symmetrical areas on each side of the rhynchocoel, passing away on each side above and below the cephalic slits. They disappear from the sections before the brain appears. The cephalic organs are somewhat small.

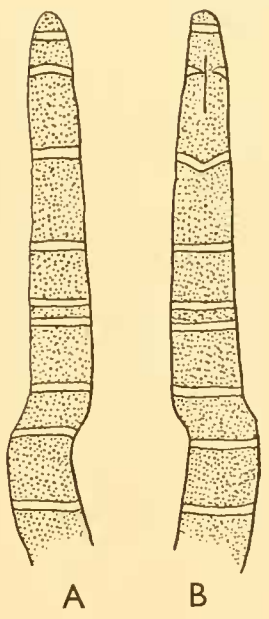

Fig. 5. *Lineus geniculatus* (Chiaje). A, dorsal; B, ventral surface of the preserved specimen. × 1.

A full description of this species is given by Bürger (1895), and to this the specimens from Annobon exactly conform.

Lineus ruber (O. F. Müller), 1771 (Plate XV, fig. 4; Fig. 6).

Twenty-three specimens were taken between July and September from the shore between tide-marks. Most of the worms were found near the whaling stations under stones on the mud, but some occurred in kelp roots from rocks on the shore outside the Bay. The largest worm was 14·0 cm. long, with a breadth of 1·0 mm.; the smallest was 5·0 cm. long, breadth 0·5 mm.

Form and colour in life. The body is round and tapers gradually at the tail. The head is rather flat and broader than the succeeding part of the body. The snout is broad and mobile. The cephalic slits are long and pale. The mouth is a small elongated slit with pale lips far back on the ventral surface of the head. The colour in life is brown, deepest anteriorly. The tail is very pale. Behind the head both dorsally and ventrally there is a large undefined reddish mark. A series of pale rings is visible on the body in some specimens. In an 11 cm. worm seventeen were counted. The tip of the snout is pale. The eyes are variable, but not more than ten were found on each side. Usually there were five in a line at the edge of the pigment.

In one specimen there was a row of minute pores showing pale on each side of the body nearer the dorsal than the ventral side. The row, marking the openings of the

genital sacs, commenced about one-third of the length of the body from the anterior end.

Form and colour of preserved specimens. The colour is bleached in spirit to a greyish white. No eyes are visible. The proboscis pore is terminal and the anterior end of the mouth is at the level of the posterior ends of the cephalic slits (Fig. 6A).

Internal structure. Frontal organs were not seen although the tip of the head was sectioned. The muscle layers are arranged typically (Fig. 6 B).

There is a single vascular lacuna dorsal to the rhynchodaeum in the head. This divides and the two lacunae thus formed split up after the region of the ganglia into numerous vessels round the gut. The dorsal vessel protrudes into the rhynchocoel.

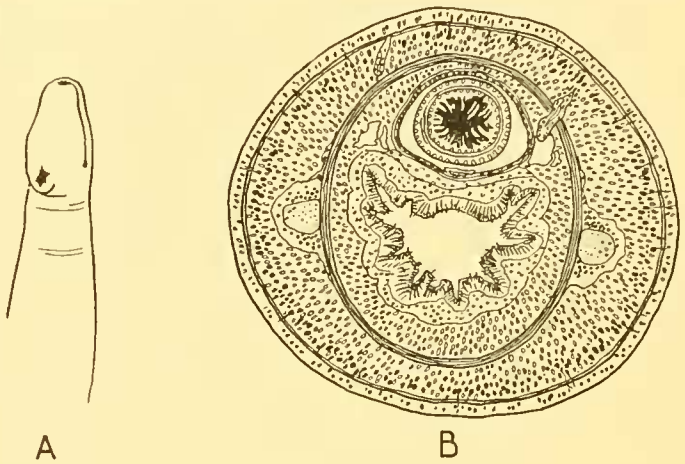

Fig. 6. *Lineus ruber*, O. F. Müller. A, head of spirit specimen, ventro-lateral; B, transverse section of body at the passing of the excretory tubules to the exterior.

The excretory tubules bulge into the large blood vessels on each side of the rhynchocoel. They occur a considerable distance behind the brain. Only one duct was found leading to the exterior on each side and it opened high up on the dorsal surface (Fig. 6B). From the persistence of the tubule in the last sections cut in series of this worm it is probable that further ducts were present. The number given by Punnett (1901) is from six to twelve on each side.

The cephalic slits continue nearly to the tip of the snout and they disappear posteriorly as soon as the canal has entered the head. The fibrous tissue of the dorsal ganglion divides posteriorly into an upper branch which quickly disappears, and a lower which becomes invested with the cerebral organ and forms the posterior lobe of the brain. This lies almost free in a blood sinus at its hinder end. When the ventral ganglia merge into the lateral nerves they shift laterally from their position directly beneath the dorsal ganglia.

The genital sacs (in the female) open high up laterally.

The green form of *L. ruber* was described by Stimpson (1856 and 1857–8) from specimens collected in Simon's Bay under the name *Cerebratulus oleaginus* (*Meckelia olivacea* in the earlier paper). The identification with *Lineus ruber* was suggested by Bürger (1895). *L. ruber* has been recorded from Madeira by Langerhans (1880).

Genus Cerebratulus, Renier

Cerebratulus aerugatus, Bürger, 1892 (Plate XV, fig. 5; Figs. 7, 8).

The anterior end of a Lineid worm was found in a kelp root torn from the rocks between the whaling stations. The length was 5·5 cm., the breadth of the head about 1·0 mm. A distinct shallow groove was noticed in the mid-dorsal line of the head. The diverticula of the gut were very regularly placed opposite one another.

Form and colour in life. The body is soft and a little flattened. The head is lance-shaped, flat and broader at the level of the ends of the cephalic slits than the succeeding part of the body. The cephalic slits are very long. There are no eyes. The mouth is small, placed mid-ventrally behind the ends of the cephalic slits. The body is reddish brown towards the anterior end, fading to yellow posteriorly. The greater part of the head is white. A vague red patch is visible dorsally and ventrally where the body colour fades at the back of the head. In spirit the colour is brownish.

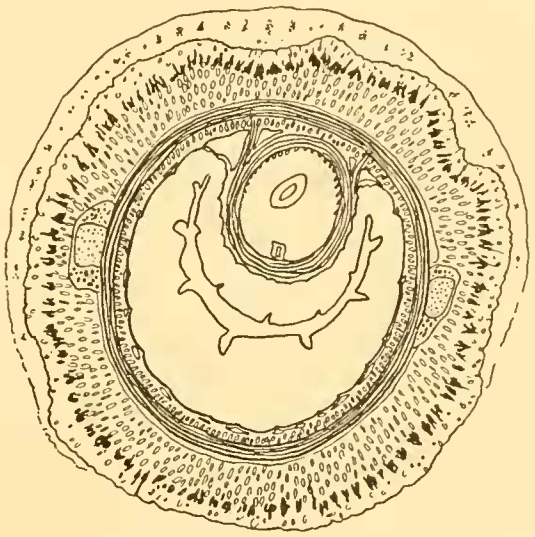

Fig. 7. *Cerebratulus aerugatus*, Bürger. Transverse section through the body to show the relative thickness of the muscle layers.

Internal structure. The tip of the snout was unfortunately missed in sectioning so that the frontal organs are not known. The head glands are thin and scattered. They extend back as far as the brain. No trace of eyes could be seen. In the stomach region the epithelium is about as thick as that part of the longitudinal muscles into which the cuticular glands penetrate. The outer longitudinal muscle layer is from three to four times as thick as the circular layer, while the inner longitudinal layer is thinner than the circular. There is no diagonal layer. The circular muscles of the rhynchocoel are about as thick as those of the circular layer of the body (Fig. 7).

There is a vascular loop in the head. Posterior to the brain the dorsal vessel protrudes into the rhynchocoel and a number of blood spaces of varying size surround the stomach (Fig. 7). The excretory system is not known.

The relations of the brain and cerebral organs are shown in Fig. 8. The fibrous tissue of the dorsal ganglia is about twice as extensive as that of the ventral and the brain is large

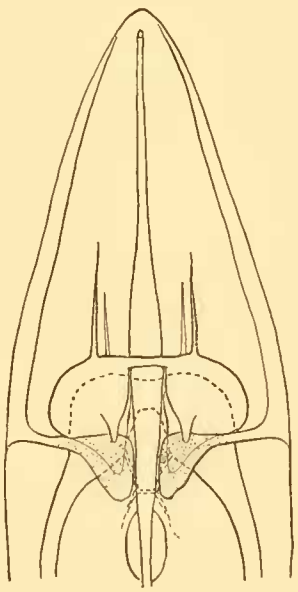

Fig. 8. *Cerebratulus aerugatus*, Bürger. Diagram from a graphic reconstruction of the brain and cerebral organs

for the size of the head. The ventral commissure is wider than the dorsal. The dorsal ganglia divide posteriorly into upper and lower branches. The small upper branches taper away rapidly while the lower become included in the cerebral organs which swell to form substantial lobes lying almost free at their hinder ends in blood sinuses formed from the lateral and median vessels. The ventral ganglia become the lateral nerves beneath the cerebral organs and leave their positions on either side of the rhynchocoel to pass down the body. Neurochord cells were observed in the cellular tissue of the inner face of the ventral ganglia just posterior to the ventral commissure.

The cephalic slits are apparent very near the tip of the head. They do not extend posteriorly beyond the cerebral canals, which pass in directly opposite the lower cornua of the dorsal ganglia.

As far as I am able to judge from the incomplete specimen the identification of this worm with *C. aerugatus* is justified.

Cerebratulus fuscus, McIntosh, 1873 (Plate XV, fig. 8; Figs. 9, 10).

Eighteen specimens were taken during August and September. This species was fairly common in the kelp roots between tide-marks both inside and outside the Bay. The lengths varied between 2·3 and 3·5 cm. with breadths of 0·8 and 1·4 mm. Specimens with eggs were collected on August 14.

Form and colour in life. The body is a little flattened from above down. The head is flat, not distinctly marked off from the body, and it tapers to a blunt snout. The cephalic slits are very long and the mouth is small, placed at the end of the head behind the brain. The small eyes vary in number and are deeply embedded. There are usually ten visible on each side; five together near the tip of the snout, the others in a line farther back. A caudal appendage is present. The range of colour is from pale buff to pink or light red on the back with scattered reddish brown splashes mainly near the middle line and less definite and paler at the posterior end of the body. The underside is pale flesh colour.

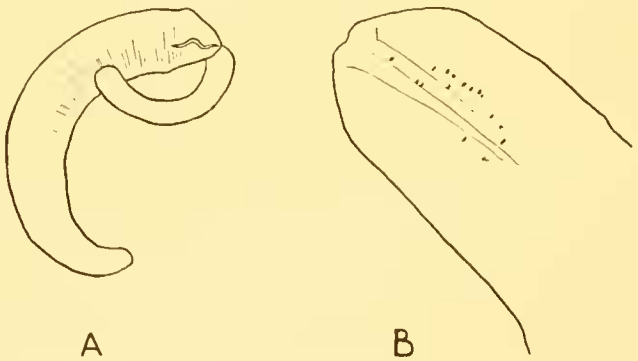

Fig. 9. *Cerebratulus fuscus*, McIntosh. A, sketch of the preserved specimen, × 4; B, lateral view of the head to show the eyespots.

Form and colour of spirit specimens. An outline sketch of a preserved specimen is shown in Fig. 9A. Neither eyes nor markings are visible. On clearing in anilin oil the eyes can be seen (Fig. 9B). The colour is completely bleached.

Internal structure. Frontal organs are present. The head glands are fairly well developed. They are more numerous dorsally than ventrally and they can be seen dorsally in transverse sections almost to the posterior end of the brain. They stain deeply with haematoxylin but not so deeply as the subepithelial gland cells. Eosinophile cells are

numerous in the epithelium. Farther back on the body many of the subepithelial cells stain with eosin.

The rhynchocoel is long, but the proboscis is attached in the first half of the body.

Two vascular lacunae close to the rhynchodaeum can be traced back to the anterior insertion of the proboscis. They reappear as a median lacuna ventral to the rhynchocoel; and from this lacuna arises the dorsal vessel and a dorsal lacuna which later divides into two lateral lacunae in which lie the cerebral organs. Posterior to the brain the vascular system has not been traced.

The brain is very large (Fig. 10). There is a strong upper branch to the dorsal ganglion posteriorly. This upper horn disappears before the lower, which is invested with the cerebral organ and forms the posterior lobe of the brain. A dorsal nerve arises from the dorsal commissure. On the intrusion of the mouth the ventral ganglia separate and from this point they may be called the lateral nerves. Previous to this the ganglia are close together and directly beneath the dorsal ganglia. They curve outwards sharply to take up their lateral positions. A pair of nerves is given off before the separation for the innervation of the pharyngeal muscles.

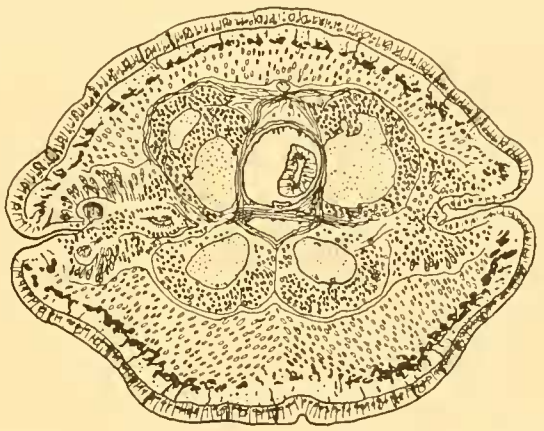

Fig. 10. *Cerebratulus fuscus*, McIntosh. Transverse section of the body at the extreme anterior limit of the mouth.

The differences between these specimens and the worms described by McIntosh (1873) are so slight that I have no hesitation in identifying them as *C. fuscus*. The pigmentation is more distinct, but worms of the same species even more distinctly marked have been described by Joubin (1894). Bürger (1895) gives the body form as characteristic—the tail being very wide. Evidently this is a variable character for McIntosh's description is "slightly tapered towards either extremity". The internal structure bears out the identification, although I have not been able to find neurochord cells in the ganglia.

An autotomized specimen (N 129) of a small heteronemertean with a caudal appendage was collected at Tristan da Cunha (St. 4). No colour note was made. The approximate length was 30·0 mm.

The body is round in section. The head is flat with long cephalic slits (3·0 mm.) and a straight slit-like mouth 1·5 mm. long. The colour is uniformly greyish. The long proboscis is protruded. The anatomical details of this form are interesting in that they are definitely against the inclusion of this form with the *Cerebratulus* of the Falklands (*C. malvini*). The peculiarly wide cephalic slits are present and the eyes, which are absent in *C. malvini*, are here evident, confined however near the tip of the head. Well-marked frontal organs are present. Head glands are very thin and scattered. The brain

is large and is similar to that of *C. fuscus*. There is a strong dorsal branch to the massive dorsal ganglion. In the absence of notes on the form and colour during life I hesitate to separate this form from *C. fuscus*, which anatomically it closely resembles.

Order HOPLONEMERTEA

Sub-order *MONOSTILIFERA*

Genus Emplectonema, Stimpson

Emplectonema ophiocephala (Schmarda), 1859 (Plate XV, fig. 14; Figs. 11, 12).

Thirty-eight specimens were captured between June and September in kelp roots from rocks between tide-marks inside and outside the Bay. The usual length was about 25 cm., breadth 1–1·5 mm. The largest worm was 40 cm., greatest breadth 2·0 mm. The majority were mature and in consequence rather swollen. In one specimen the gut was full of grey mud. Damaged worms were frequent as the body is very soft.

Form and colour during life. The body is long and soft. A distinction can be drawn between head and body, as the posterior end of the flattened lanceolate head is slightly broader than the succeeding part of the body. Anteriorly the head tapers to an acute snout. Neither mouth nor cephalic slits can be seen, but occasionally a pair of faintly marked sloping lateral grooves are apparent behind the head. Deep transverse wrinkles appear when the body contracts. The colour is generally yellow, but may vary from lemon yellow or yellow-brown to reddish or orange. The head and tail are paler than the rest of the body. There are elongated groups of small eyespots on each side of the head—about twenty in each group—spreading out somewhat posteriorly. In small worms (6–7 cm. long) there are from four to twelve eyes visible on each side. The brain shows as a pinkish, brownish or greyish bilobed structure through the skin just behind the groups of eyespots (Fig. 11A). The genital sacs show white through the skin.

Form and colour of preserved specimens. The worms frequently contract violently and break up during preservation. In spirit they are bleached, and the form is often distorted by bulges and knot-like swellings. The eyes and cephalic slits are not visible. The proboscis pore is just beneath the tip of the head. On clearing in anilin oil the brown or black cup-shaped eyes can be seen. They vary greatly in number from seven or eight on each side to thirty. When seen partly from the side (Fig. 11B) or from above, each group can be divided into two rows. The eyes of the outer row open forwards, those of the inner row backwards and upwards. There are usually more eyes in the inner row, but they are smaller than those of the outer.

Internal structure. The oesophagus opens into the rhynchodaeum. The gut is capacious. Behind the rhynchocoel it occupies the entire body cavity. The anterior caecum does not extend far forwards (it does not appear in either of my two series of sections). Frontal organs are absent. The head glands consist of a thin solid strand, staining with eosin, dorsal to the rhynchodaeum, extending back, thinning out and disappearing before the separation of the oesophagus and rhynchodaeum. Near the tip of

the head there are small round eosinophile cells scattered among the muscle strands. These apparently open into the rhynchodaeum. The tissues of the body cavity stain deeply with haematoxylin or carmine, giving the impression of a thick mucus in which deeply staining granules are embedded.

The epithelium is very thick. The basement membrane is a little thicker than the circular muscle layer. It is homogeneous in appearance and stains with eosin. The longitudinal muscle layer is somewhat thicker than the epithelium and the fibres are packed in conspicuous bundles. The ganglia are enveloped in a coat of longitudinal fibres. In the body behind the brain this muscle layer splits into bundles which pass gradually outwards and rejoin the longitudinal layer of the body. The eyes are just inside the muscles, embedded in the connective tissue.

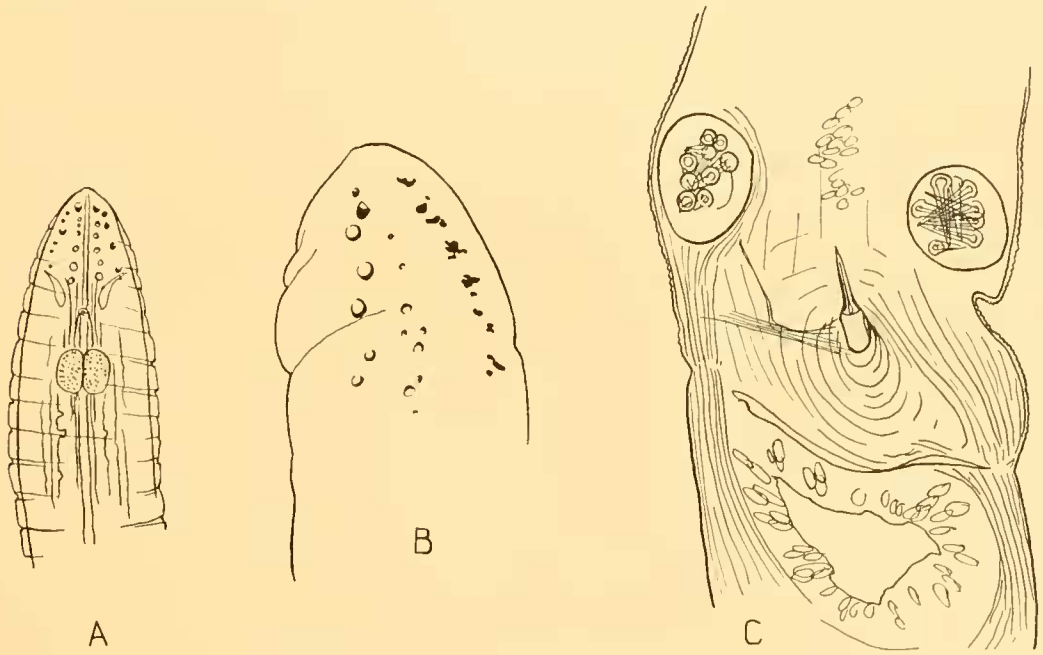

Fig. 11. *Emplectonema ophiocephala* (Schmarda). A, sketch of head cleared in cedar oil; B, head cleared in cedar oil, dorso-lateral view to show the eyespots; C, armature, cleared in cedar oil.

The rhynchocoel does not extend beyond the anterior third of the body. The proboscis is short and thin. Both rhynchocoel and proboscis are greatly restricted by the closely opposed ganglia. The armature appears to vary. Two accessory stylet reservoirs are always present, but the number of stylets differs. In two worms of nearly the same size taken at the same time, the accessory stylets numbered one and two in one, and eight and nine in the other (Fig. 11 C). A third specimen possessed two and three stylets. There is a stout main stylet mounted on a slightly hour-glass-shaped base shorter than the stylet itself.

Vascular system. There are two lateral vessels in the head. They have not been traced at the ganglia, but the blood is responsible for the colour of the brain in the living animal, so the vessels are broken up into fine branches. Directly behind the brain there are two

vessels at the outside upper corners of the stomach and two lower than these near the lateral nerves. Farther back in the body there are two laterals near the nerve trunks and a dorsal median vessel above the gut.

Excretory system. The convoluted tubules lie beside the stomach and gut. They extend forwards to just behind the brain. The posterior limit of the tubules was not seen in either series of sections, but two pairs of efferent ducts—the posterior pair almost 2 mm. behind the anterior—were observed. The ducts pass over the lateral nerves, then downwards and outwards through the body wall.

Nervous system. The brain is peculiarly compact (Figs. 11A, 12). The ganglia are very close together, so that the rhynchocoel and proboscis are much constricted where they pass through the brain. There is little distinction between dorsal and ventral ganglion. The ventral commissure is extraordinarily deep and broad. In the specimen examined the brain was 0·4 mm. long and 0·25 mm. thick. The ventral commissure was 0·27 mm. long and 0·125 mm. thick—half the thickness of the brain and nearly three-quarters of the length. The dorsal commissure was 0·08 mm. long. The lateral nerves leave the brain at right angles to the long axis. They make a sharp turn back to pass laterally down the body inside the longitudinal muscles. A marked swelling of the nerves occurs after they leave the brain and before they turn.

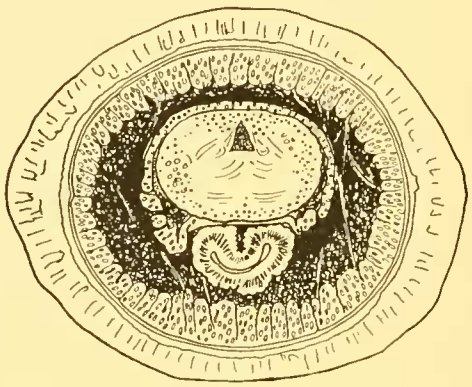

Fig. 12. *Emplectonema ophiocephala* (Schmarda). Transverse section through the brain.

The cerebral organs are very small. They are sac-like organs lying some distance in front of the brain and are connected with the dorsal ganglion of each side by a stout nerve which penetrates the muscular sheath and reaches the ganglion about one-third of the length of the brain from the anterior end. The cerebral canals open to the exterior near the tip of the snout (Fig. 11A).

Ommatoplea ophiocephala, Schmarda (1859), is considered to have been a *Eupolia* by Bürger (1895, p. 27). Schmarda refers the genus *Ommatoplea* to Ehrenberg and this is synonymous with *Eunemertes* (Bürger, 1895, p. 13). Schmarda's account of the worms found under stones and in sand in Table Bay, South Africa, corresponds fairly well with the description given above. His specimens were larger. He mentions the length as 1 m., the greatest breadth 10 mm., the colour as lemon yellow or golden brown, and the (eight) eyes in two lines on both sides of the head. The "small egg-shaped subterminal" mouth is evidently the opening of the rhynchodaeum, and the terminal pore may have been the opening of the head gland.

In many ways these specimens are similar to *Eunemertes antonina*, Quatrefages. The peculiarities of the brain which characterize this Mediterranean species, the swelling and course of the lateral nerves, the position and size of the cerebral organs and canals are alike in both. Even the darkly-stained connective tissue of the cavity of the body, re-

marked upon by Bürger (1895, p. 547), appears in these Saldanha Bay forms. The chief difference lies in the uniform rose red or carmine tint of *E. antonina*, which is considered characteristic of the species by Hubrecht (1879, p. 231). The colour is noted also by Joubin (1894, p. 206). The body of *E. antonina* appears to be considerably more slender than this South African worm, and the main stylet in the armature of the latter does not bear the proportion 3 : 1 to its base, although it is certainly longer than the base in the specimens I have examined. Taking these facts into consideration I do not consider the identification of these worms with *E. antonina* is justified, but there seem to be good grounds for considering that the same forms were described by Schmarda under the specific name *ophiocephala*.

Genus Nemertopsis, Bürger

Nemertopsis tenuis, Bürger, 1895 (Plate XV, fig. 7).

Eight specimens were found at different dates in attached kelp roots from the granite boulders between tide-marks on the outer coast. The lengths ranged from 10 to 41 mm., the corresponding breadths being 0·3 and 0·4–0·5 mm.

Form and colour in life. The body is very thin, almost Nematode-like. The head is not distinct from the body, and the tail tapers acutely. The four small eyes occur in close-set pairs, the posterior pair being very far behind the anterior. The colour is yellowish brown and the gut shows pale through the skin. Yellow-red blood vessels, especially the dorsal vessel in the posterior half of the body, are evident in some specimens.

Form and colour of preserved specimens. Considerable shrinkage takes place after preservation. The colour is bleached. On clearing in anilin oil the brown cup-like eyes can be faintly seen.

Internal structure. The oesophagus opens into the rhynchodaeum just posterior to the cerebral organs and in front of the brain. The contents of the cells of the stomach wall stain deeply with haematoxylin. The anterior caecum has no forward branches.

The epithelium is as thick as the longitudinal muscle layer, and the basement membrane is about half as thick as the circular muscle layer. The longitudinal muscles are not conspicuously divided into bundles. A compact head gland is present, opening dorsally just above the proboscis pore. The head gland reaches the brain.

The rhynchocoel extends about one-third of the body length. The proboscis has ten nerves. The armature is not known.

There are two definite blood vessels in the head forming a loop beneath the head gland. At the ganglia these vessels become difficult to trace, but posterior to the excretory tubules there are two vessels lateral to the rhynchocoel and a median vessel above the gut. This median vessel is formed originally of branches from the laterals.

The convoluted excretory tubule is packed closely behind the dorsal ganglion and opens to the exterior by a single duct above the lateral nerve.

The brain is not peculiar. The ventral commissure is thicker than the dorsal, and the lateral nerves leave the brain sharply and turn back as sharply after undergoing a knot-

like enlargement. The eyes are embedded within the longitudinal muscle layer. The second pair occurs immediately before the brain. The cerebral organs are very small. They lie in front of the brain and their canals open behind the first pair of eyes into a transverse lateral groove that occurs on each side of the head.

Nearly ripe eggs were present in some specimens. The eggs are shed just above the lateral nerves.

In two particulars—the yellow rather than rose colour of the body and the presence of a head gland—this description differs from that of Bürger.

Another specimen (N 109) was identified from sections. It was 10 mm. long, 0·3 mm. broad, bleached and coiled. This was taken at St. WS 4 in 40 m.

Genus Amphiporus, Ehrenberg

Amphiporus pulcher, Johnston, 1837 (Plate XV, fig. 13).

Two specimens (N 36) were taken from attached and washed-up kelp roots in September 1926 on the southern point of Saldanha Bay. The lengths and breadths were 3·5 cm., 1·5 mm., breadth of head 1·0 mm.; 4·2 cm., 1·7 mm. (swollen with eggs).

Form and colour in life. The body is round anteriorly, somewhat flatter and wider posteriorly. The head is a little flattened, almost semicircular in outline from above, but has a slight snout. The mouth, proboscis pore and cephalic slits are not visible, but a chevron groove can sometimes be seen at the back of the head. The colour is pinkish yellow or buff, lighter anteriorly and deepest on the back. The ganglia show red through the skin. About ten eyes are visible on each side in no definite order, but there is usually a row of four in a line nearly parallel to the edge of the head from the tip to the widest part.

Form and colour of preserved specimens. In spirit the worms are white and contracted. Cephalic grooves appear as vertical furrows at the sides behind the head, curving forwards ventrally. The proboscis pore is ventral to the tip of the snout in a furrow that passes vertically round the head.

Internal structure. Well developed head glands are present but they do not reach the brain. There is a strand close above the rhynchodaeum which stretches back beneath the vascular loop almost to the ganglia, and more diffuse glands among the muscles of the head which become restricted near the ganglia to the sides of the body cavity inside the longitudinal muscles. The duct of the head gland opens just ventral to the tip of the snout. The eyes are embedded deeply in the tissues of the head.

The epithelium is thinner than the longitudinal muscles and about three times as thick as the basement membrane and circular muscles together. The basement membrane is twice as thick as the circular layer and appears to contain fibres. The epithelium contains a large number of eosinophile cells.

The oesophagus opens into the rhynchodaeum in front of the brain. The stomach walls are not much folded and most of the cell contents stain deeply with haematoxylin. The anterior caecum has forwardly directed branches, two of which extend beyond the

others on each side of the rhynchocoel. They do not approach the brain. The proboscis is attached about the half length of the body. The rhynchocoel extends the whole length. The accessory armature consists of two reservoirs each with five or six stylets. There are eleven nerve strands in the proboscis.

Two blood vessels, one on each side of the rhynchodaeum, form a loop in the head. They are lost at the ganglia, but reappear as two lateral vessels above the nerves. A dorsal vessel above the gut is connected by a branch on each side with the lateral.

The excretory tubules are packed close behind the ganglia. From them single ducts on each side pass back above the lateral nerves and vessels and turn outwards some distance behind the brain.

The dorsal commissure is longer and thinner than the ventral. The ventral ganglia, becoming the lateral nerves, shift very gradually outwards. The dorsal ganglia taper posteriorly and the cerebral canals pass in beneath them and widen into the cerebral organs which are thus wedged between dorsal and ventral ganglia behind the ventral commissure. The organs swell as the dorsal ganglia diminish in size, and when the latter join them they are somewhat flattened bodies larger in cross-section than the lateral nerves at the same point. They are rounded posteriorly, but extend back some distance from the point of fusion with the fibres of the dorsal ganglia.

There seems little doubt about this identification. Graphic reconstruction of the head of the specimen sectioned gives a plan of the vascular and nervous systems identical with that figured by McIntosh (1873), and in all particulars the description corresponds with those of other workers.

Another specimen (N 127) was collected by Mr E. R. Gunther from a sponge brought to the surface from 292–402 m. by a trawler from Cape Town on July 8, 1927. This was noted in life as "flesh-coloured".

The preserved specimen was 27 mm. in length, 7 mm. broad and 3·5 mm. thick. The body was stout and flattened from above down. It was sectioned and identified with this species.

Genus Zygonemertes, Montgomery

Zygonemertes capensis, n.sp. (Plate XV, figs. 3, 6, 12; Figs. 13–16).

Variations in colour and form were responsible for five descriptions and sketches of this worm (N 26, N 29, N 33, N 38, N 39). These five have been reduced to three fairly constant colour variations which are described and figured separately.

(1) *Green form.* Twenty-seven specimens were taken from attached and washed-up kelp roots inside and outside the south arm of the Bay. The largest worms were 80 mm. long, 1·5–2·0 mm. in breadth; the smallest 14 mm. long, 0·5 mm. in breadth.

In life the body is slightly flattened and soft. The head is flat, broader than the succeeding part of the body and somewhat diamond-shaped in outline from above. The snout is blunt. The tail is pointed and a little bulbous. Neither mouth nor cephalic slits can be seen. The colour on the back is green, greyish green, or light brown tinged

with green. The underside is buff or yellowish. The head appears lighter than the body but is, in fact, more distinctly green, and there shows faintly upon it a pale mid-dorsal longitudinal streak. The posterior end of the body is yellowish. Under low magnification black specks can be seen scattered thickly over the head and body. The eyes are many and small. They occur in four sectors over the head, leaving three narrow paths devoid of eyes diverging from one another from the tip of the snout (Plate XV, fig. 3). As the eyes are embedded in the muscles of the head the number seen in life—about twelve in the inner and eighteen in the outer group on each side—is not only variable but is nothing like the total number, because the posterior groups only become visible on clearing in anilin or clove oil.

A specimen similar to this form, 50 mm. long and 1·2 mm. broad (breadth of head 0·75 mm.), was collected at the end of July. A transverse groove encircled the body a short distance behind the head. The eyes were very indistinct. The ganglia showed brown through the skin and the swollen body was tinged with orange. This specimen was a ripe male.

(2) *Brown form.* Three specimens from kelp roots from the outer rocks were similar in size and shape to the green form but were of a light brown colour very distinctly tinged with mauve. A slight speckling of reddish brown occurred, especially anteriorly. The ganglia showed green through the skin. The eyes were irregular in size and arrangement (Plate XV, fig. 12).

(3) *Colourless form.* Twenty-four specimens were taken. The largest was 34 mm. long and 0·5 mm. broad. They were almost transparent at the edges of the body and white or very faint yellow when seen against a dark background. The eyes appeared to be even more irregular than in the brown form. They were collected from inside and outside the Bay (Plate XV, fig. 6).

The fifth colour variant was similar to the colourless forms, but there was a pale brown collar in the region of the ganglia. One specimen only was taken.

Form and colour of preserved specimens. Shrinkage takes place but the body form is retained. In about half the specimens the proboscis is partially protruded. Both the coloured forms retain a hard bright blue-green colour on the back, and this colour resists spirit for at least two years. The underside of preserved specimens is pale yellow, and the colourless forms are white. No eyes can be seen. The proboscis pore is situated just ventral to the tip of the head. Cephalic furrows can be seen curving round dorsally as they pass back from the snout.

On clearing in anilin oil three groups of eyespots can be seen on each side of the head. Two of these groups are the ones already mentioned. The third group are dorso-lateral on the body immediately behind the head. The eyes are small, variable sized and cup-shaped. Those of the outer anterior group—about fifty—open forwards; those of the inner anterior group—forty to forty-five—open rather backwards; and the posterior set —thirty or so—open mainly laterally (Fig. 13). In the uncoloured forms the eyespots themselves are bright green.

Internal structure. No frontal organs could be recognized in sections. The epithelium

is almost as thick as the longitudinal layer of muscles and between two and four times as thick as the basement membrane and circular muscles together. These last are about equal in thickness. There are many large gland cells in the epithelium; they may be the black specks of the living animal. The sickle-shaped bodies similar to those first described by Marion (1872) are found in the epithelium of all forms; they appear to resist acid and are yellowish brown in colour (Fig. 14). The fibre-containing basement membrane stains deeply with haematoxylin, and numerous minute ducts can be seen penetrating it, especially on the head. Often the glands are themselves in the membrane but sometimes they are more deeply placed in the longitudinal muscles. Farther down the body they are much less frequent.

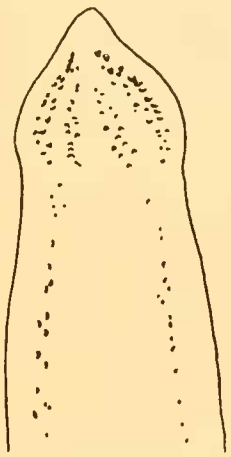

Fig. 13. *Zygonemertes capensis*, n.sp. Head, dorsal surface, cleared in anilin oil to show the three groups of eyespots.

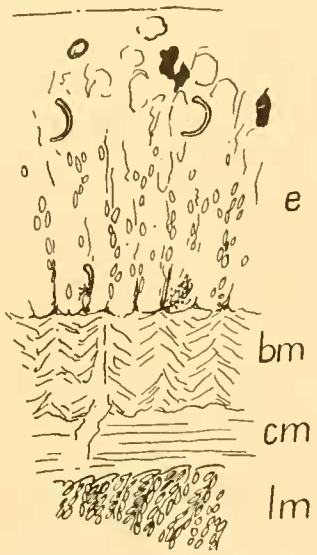

Fig. 14. *Zygonemertes capensis*, n.sp. Part of a transverse section highly magnified. *e*, epithelium containing sickle-shaped bodies; *bm*, basement membrane; *cm*, circular muscle layer; *lm*, longitudinal muscle layer.

The oesophagus opens into the rhynchodaeum before the brain. In the region of the ganglia the oesophagus widens. Farther back it opens into the stomach with dark-stained granules in the cells of the folded walls and on each side appears a branch of the anterior caecum. These two diverticula do not reach the brain.

There is a vascular loop in the tip of the head. In the brain region the lateral vessels are widened, their walls become definite and they are connected with the dorsal vessel above the gut. The three vessels pass down the body and join again above the gut just before the insertion of the rhynchocoel into the body wall. The excretory vessels lie above the lateral nerves behind the brain. A single duct on each side opens to the exterior opposite the nerves. The ganglia are not peculiar, but the brain is rather large (Fig. 15A). The lateral nerves give off branches which pass round the rhynchocoel, and at the posterior end of the body they join above the gut anterior to the anus. The cerebral canals open ventro-laterally a little way behind the opening of the oesophagus into the

rhynchodaeum. The organs are small and do not reach the ganglia, but a stout nerve has been traced to them from the brain.

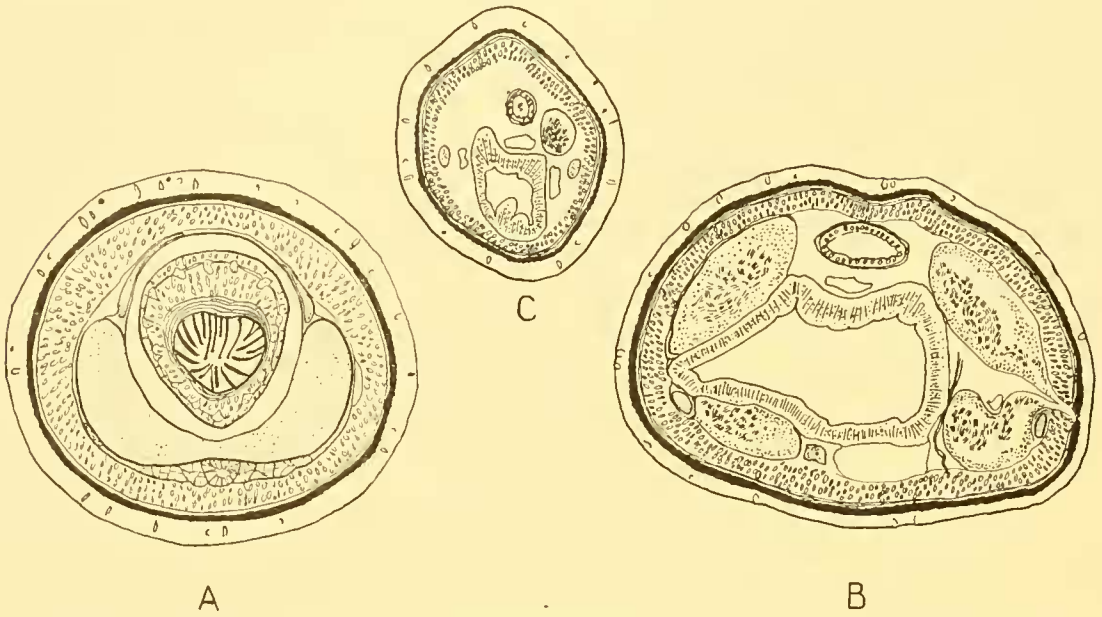

Fig. 15. *Zygonemertes capensis*, n.sp. A, transverse section across the head at the level of the ventral commissure; B, transverse section across the body at about half its length to show the opening of the genital sacs; C, transverse section 0·025 mm. from tip of tail.

In some specimens the protruded proboscis is nearly as long as the body, in others it is about a quarter of the body length. These differences are probably due to different states of contraction and extension of the proboscis and body on fixing. There are thirteen nerves. That part of the proboscis posterior to the armature is shorter than the anterior part and is inserted in the rhynchocoel at about one-third or half the length of the body. The rhynchocoel extends to the posterior end of the body (Figs. 15B and C). The armature (Fig. 16) consists of a main stylet on a base of unusual length, and two accessory reservoirs each with two, three or four stylets. Often one of the accessory stylets is incomplete. The base of the main stylet varies between two and a half to five times the length of the stylet. Measurements of three armatures from green and brown forms are given below:

Main stylet (mm.) ...	0·115	0·156	0·133
Base of stylet (mm.) ...	0·518	0·714	0·301
Accessory stylet (mm.)	0·164	0·182	0·130

In the uncoloured forms the difference in length between base and main stylet is not so marked:

Main stylet (mm.) ...	...	0·078	0·050
Base of stylet (mm.)	...	0·117	0·084

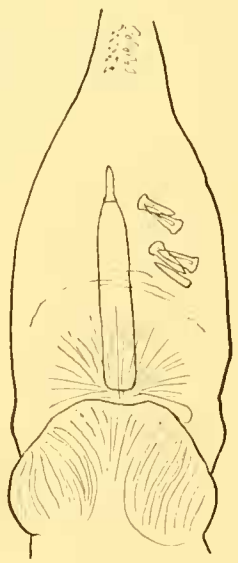

Fig. 16. *Zygonemertes capensis*, n.sp. Armature of the green form (cleared in anilin oil).

Both sexes of each form were examined. Ova are shed by separate ducts forming when required through the dorsal muscles and epithelium. Spermatozoa are shed just above the lateral nerves (Fig. 15B). Ripe eggs are present in August.

The examination of sections showed that the original identification of these worms with *Emplectonema echinoderma*, Marion, was inadmissable on account of the extent of the rhynchocoel. It is evident that there is a close relationship with *Zygonemertes virescens* (Verrill) Montgomery, but there are also differences—the larger size, the absence of a terminal sense organ, the relatively larger base to the main stylet, the larger number of eyes, the greater number of nerves in the proboscis—which justify the establishment of a new species.

Genus Tetrastemma, Ehrenberg

Tetrastemma candidum, O. F. Müller, 1774 (Plate XV, fig. 15).

T. incisum, Stimpson, 1856.

Thirty-five specimens were captured in attached and washed-up kelp roots from the rocks at the entrance of the Bay. The lengths were usually about 10 mm., breadth 0·5 mm., but sometimes they reached 16 mm., breadth 0·75 mm.

Form and colour in life. The body is round in section, tapering posteriorly to the tail. The head is slightly broader than the body. The mouth is not visible. On each side of the head there is a nearly vertical groove and occasionally a second pair of grooves can be seen immediately behind the head.

The colour is pale buff or light brown. The edges of the body appear transparent, and the gut is visible through the skin. There are four eyespots forming the corners of an almost perfect square. The posterior pair is just behind the anterior grooves.

Form and colour of preserved specimens. In spirit the ratio of length to breadth is altered—an 11 mm. worm being 1·5 mm. broad, and a 9·5 mm. worm 1·2 mm. broad. The colour is bleached, and the eyespots cannot be seen either before or after clearing in clove or anilin oil.

Internal structure. The oesophagus and rhynchodaeum coincide and the common opening is immediately ventral to the tip of the head. The head glands are thin and small. They just reach the brain. There are lateral and dorsal strands, the former joining together near the tip of the head to form a ventral strand. They open at the extreme end of the snout.

In the region of the anterior caecum the epithelium is about two and a half times as thick as the circular muscle layer and the basement membrane together, while the circular muscle layer is a little thicker than the basement membrane. The longitudinal muscle is thin. The eyes are visible in sections deeply sunk in the muscles of the head.

Branches from the anterior caecum extend as far forward as the brain.

The cephalic slits are deep grooves almost completely ventral near the tip of the head. They pass back, upwards and outwards and become canals sinking into the longitudinal

muscles. Glandular tissue encloses the canals and a nerve from each dorsal ganglion passes into the organ.

The dorsal ganglia are smaller than the ventral. There are ten nerves in the proboscis.

No excretory vessels or ducts could be traced.

The armature consists of a main stylet on a base somewhat longer than itself and two accessory reservoirs. In one worm three accessory stylets were present in each reservoir but in others there were only two. The lengths were as follows:

Main stylet 0·067 mm., accessory stylet 0·058 mm., base 0·077 mm.

This species appears to correspond with *Tetrastemma incisum*, Stimpson (1856). I can see no reason for separating it from *T. candidum*, Müller, since in size and shape of the body and head, and in the absence of markings it agrees closely with a colour variant of this species.

Tetrastemma nigrolineatum, n.sp. (Plate XV, fig. 9; Fig. 17).

A single specimen was taken in July from a kelp root inside the Bay. The length was 25 mm., breadth about 0·3 mm.

This slender worm appears to be rectangular in section, and the head is wedge-shaped when seen from the side. There are no eyespots and neither mouth nor cephalic slits are visible. The colour is whitish green, with two parallel black lines passing down the back from tip of snout to tip of tail. At the head these lines are thinner than they are on the body.

In spirit traces of the double dark line can be seen.

Internal structure. Head glands are absent. The epithelium is about as thick as the longitudinal muscle layer. The basement membrane and circular muscles are thin. The former is thinner than the latter and stains with haematoxylin. Brown pigment granules are present at the base of the epithelial cells where the dark lines can be seen in life. There are no traces of eyespots.

The oesophagus opens into the rhynchodaeum, and the common pore is ventral to the tip of the head. The narrow oesophagus opens into a folded stomach with deeply staining walls just posterior to the dorsal ganglia. The unbranched anterior caecum ends a long way behind the brain.

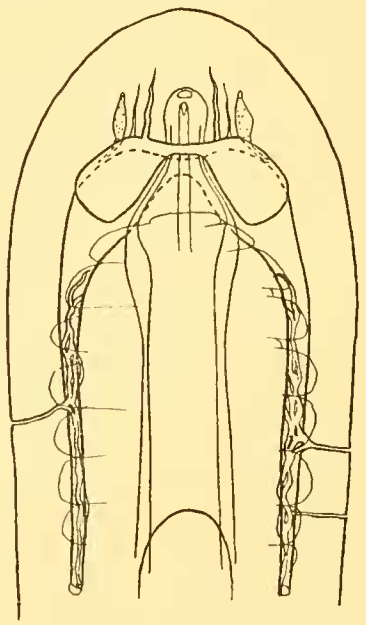

Fig. 17. *Tetrastemma nigrolineatum*, n.sp. Diagram from a graphic reconstruction of the brain, cerebral organs, excretory and alimentary systems.

The proboscis extends well into the posterior half of the body, and the rhynchocoel into the posterior third. The armature consists of a single main stylet on a reddish brown base and two reservoirs with seven or eight accessory stylets. Some of these are incomplete.

The two blood vessels in the head form a loop. They lie one on each side of the rhynchocoel in the brain region and subsequently dorsal to the lateral nerves, after connecting up with the dorsal vessel in the ventral wall of the rhynchocoel. Just before the excretory ducts pass to the exterior the lateral vessels shift round inside the lateral nerves and continue down the body beneath them. The excretory system consists of the usual convoluted tubules close above the lateral nerves. In front of the anterior caecum a duct leads to the exterior on each side above the nerve (on one side of this worm there were two ducts).

The brain is large for the size of the head, but it is compact and well defined. There is a large proportion of fibrous tissue in both ganglia. The dorsal ganglia are smaller than the ventral and the dorsal commissure is thinner and in advance of the ventral. The cerebral organs are small sacs opening near the proboscis pore on the ventral surface. They just reach the brain. The relations of brain, cerebral organs, excretory and alimentary systems are shown in Fig. 17.

This worm is very similar to *Nemertopsis bivittata*, Chiaje, with the exception of the four eyes, but its internal structure shows that its affinities are with *Tetrastemma* rather than *Nemertopsis*.

Genus Oerstedia, Quatrefages

Oerstedia maculata, n.sp. (Plate XV, fig. 11; Fig. 18).

Five specimens (N 40) were collected from kelp roots from the outer beaches in September. The lengths were 6, 7 and 8 mm. with breadths of 0·25–0·4 mm. The largest specimen was 12 mm., breadth 0·4 mm. This species exhibited a semi-rigid form like that of *O. dorsalis*, Abildg., and when in movement the head was often held upon one side. In one of the worms this feature seemed permanent. A double eyespot was observed in one specimen and ripe eggs were present in one.

Form and colour in life. The body is round in section and short, with little distinction between head and tail. The snout is blunt. Four large eyespots are apparent, but, as shown later, the eyespots are double. They are placed in pairs one behind the other at a greater distance than in *Tetrastemma candidum*. The colour is pale buff with one or two indefinite and irregular small brown spots on the back.

In spirit specimens the eyespots and markings are not visible, but the eyes on clearing can be seen faintly as brownish marks.

Internal structure. The epithelium in the stomach region is somewhat thicker than basement membrane and the two muscle layers together. The basement membrane is homogeneous and thicker than the circular muscles. The longitudinal muscle layer is not divided into bundles. The oesophagus opens into the rhynchodaeum near the opening of the latter to the exterior. A large unbranched anterior caecum is present, reaching almost as far forwards as the brain. The proboscis is long and the rhynchocoel extends almost the whole length of the body. The head glands form a compact mass, spreading posteriorly and just reaching back to the ganglia. They open above the proboscis pore.

The armature consists of a main stylet and two accessory stylet reservoirs each with two stylets.

The vascular system is of the usual type—two lateral vessels and a dorsal vessel above the gut. In the brain region the laterals are above the lateral nerves, but just behind the brain they pass below and continue beside the gut (Fig. 18A).

There is a convoluted excretory tubule on each side close behind the ganglia opening above the lateral nerves.

The ganglia are large in proportion to the size of the animal. Both commissures are thin. The fibres of the dorsal ganglia (lower posterior angle) continue into the lateral

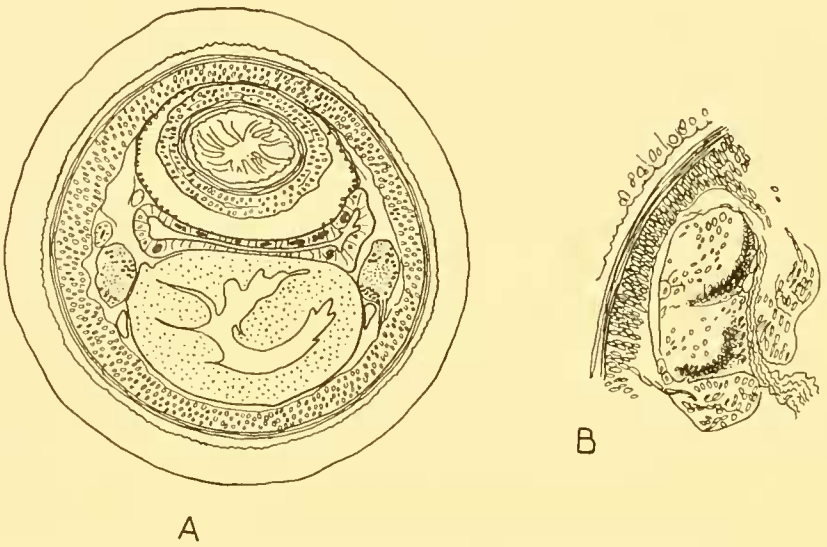

Fig. 18. *Oerstedia maculata*, n.sp. A, transverse section of the body in the region of the stomach and anterior caecum; B, part of a transverse section of the head, highly magnified, to show the double eyes.

nerves and retain their individuality down the body. They are separated from the ventral fibres by cellular tissue. The lateral nerves unite before the anus above the gut. There are ten nerves in the proboscis.

The cerebral organs are small sacs lying a long way in front of the brain, each with a short narrow canal leading to the exterior on the ventral surface near the proboscis pore. There is no external furrow.

The eyespots are double (Fig. 18B). The anterior pair is close behind the cerebral organs and the posterior pair directly in front of the dorsal ganglia.

The specimen sectioned was a male with ripe sperm.

PART II. NEMERTEANS FROM THE FALKLAND ISLANDS, SOUTH GEORGIA AND THE ISLANDS AND BANKS OF THE WESTERN SOUTH ATLANTIC OCEAN

Of the twenty-five species here described only the littoral forms from South Georgia and the Falklands were sketched in life. The remainder were taken in nets at sea and only occasional colour notes were made. Twelve species had been previously described and six of these are here figured for the first time in colour. The South Georgia specimens were mainly collected from the roots of kelp off the Point, King Edward Cove, close to the whaling station of the Cia Argentina de Pesca. The water here was from 4 to 6 m. deep and the bottom was very muddy and greasy from the years of whaling activity at the head of the cove. Throughout the area *Lineus corrugatus*, McIntosh, was by far the most common species.

On the Burdwood Bank, off the Falklands, South Shetlands and South Orkneys, specimens were brought up by the ships while dredging or trawling. The deepest capture was *Amphiporus lecointei*, Bürger, from 401 m. at St. 158.

No representatives of the Paleonemertea were taken. The Hoplonemertea and the Heteronemertea are strongly represented, the former by nine species each of *Tetrastemma* and *Amphiporus*, the latter by one or more species of the genera *Baseodiscus*, *Parapolia*, *Lineus* and *Cerebratulus*.

Order HETERONEMERTEA

Genus Baseodiscus, Diesing

Baseodiscus antarcticus, Baylis, 1915 (Figs. 19, 20).

One specimen (N 59) was taken at St. 182 in 278–500 m. No record exists of its appearance in life. Two large specimens taken at St. WS 73 were found among the collection and identified with the previous specimen. These were accompanied by a note: "Larger specimen 28 cm. long and 0·5 cm. wide. Both of a pinkish colour, deeper along the mid-dorsal and mid-ventral lines". The specimen from St. 182 is a small nearly cylindrical worm, blunt at both ends, 25 mm. long and 2 mm. in diameter. The colour is very pale brown with no trace of markings. The larger specimen from St. WS 73 is 300 mm. long and 6·5 mm. wide, the smaller 130 mm. long and 3·5 mm. wide. Both are pale yellow-brown with no markings.

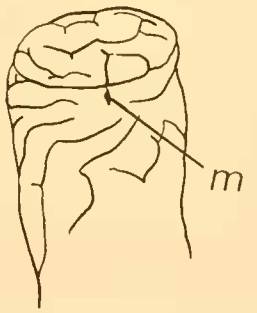

Fig. 19. *Baseodiscus antarcticus*, Baylis. Head of preserved specimen, ventral surface, to show the annular furrow and the mouth (*m*).

The following notes may be added to the description given by Baylis (1915):

The body is soft and flattened except at the head. Both head and tail are blunt; in fact, when the worms have been preserved it is difficult to identify the head, it resembles so much a broken end of the body. The back is very

wrinkled, the small deep wrinkles giving almost a matted appearance. Down the centre of the back is a raised ridge with a longitudinal groove on each side of it. Ventrally the wrinkling is mainly in the form of longitudinal furrows of which the median ones are the deepest. There is a furrow at the back of the head and the mouth is just behind this in the middle line (Fig. 19).

Internal structure. There appear to be frontal organs as shallow pits at the corners of a depression at the tip of the head. Head glands are not evident in the early sections, but about midway between the proboscis pore and the brain they appear, stained palely with haematoxylin, scattered through the musculature, especially ventrolaterally. Dorsally they are thin, also mid-ventrally, and they disappear altogether before the brain.

The position of the brain, cerebral organs, proboscis pore and mouth can be seen in the graphic reconstruction (Fig. 20). The proboscis is thin and also its sheath. The mouth is small and rounded. The epithelial layer is thin and the cutis deep. The gelatinous tissue developed between the bundles of the outer longitudinal muscle layer (Baylis) is extraordinarily well-marked in the larger specimens and is responsible for the unusual degree of wrinkling of the skin.

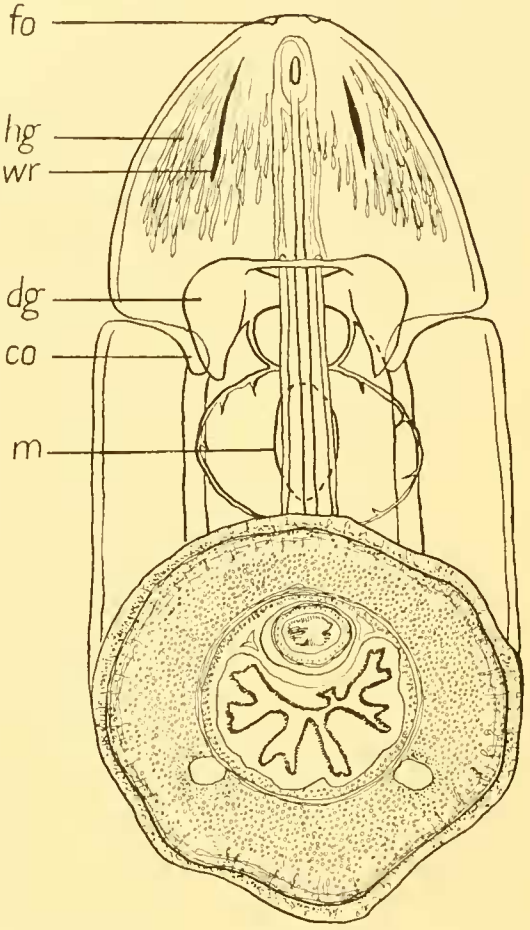

Fig. 20. *Baseodiscus antarcticus*, Baylis. Diagram of the organs at the anterior end of the body and head. *co*, cerebral organ; *dg*, dorsal ganglion; *fo*, frontal organ; *hg*, head gland; *m*, mouth; *wr*, deep wrinkles on the dorsal surface of the head. (From a graphic reconstruction.)

Genus Parapolia, Coe

Parapolia grytvikenensis, n.sp. (Plate XVI, fig. 14; Figs. 21, 22).

One specimen (N 43) was collected at St. 123 from 230–250 m. The contracted length in life was 4 cm., breadth 0·27 cm.

Form and colour in life. The body is stout and cylindrical in the passive and contracted condition in which the single specimen was found. The head is acutely pointed, flattened, and is separated from the body by a slight "neck". The tail is blunt. The mouth can be seen as a small longitudinal slit some way back from the tip of the head. Neither cephalic slits nor eyespots can be seen. The colour is pinkish brown, darkening towards the tail.

Form and colour of spirit specimen. The length is 2·8 cm., the greatest breadth 0·35 cm. The body is round in section anteriorly, flattened from above down posteriorly. The head is small and pointed and is separated from the body by a shallow circular depression. The mouth is mid-ventral—a small slit with definite lips—situated in the depression and on each side are small vertical furrows (Fig. 21 A).

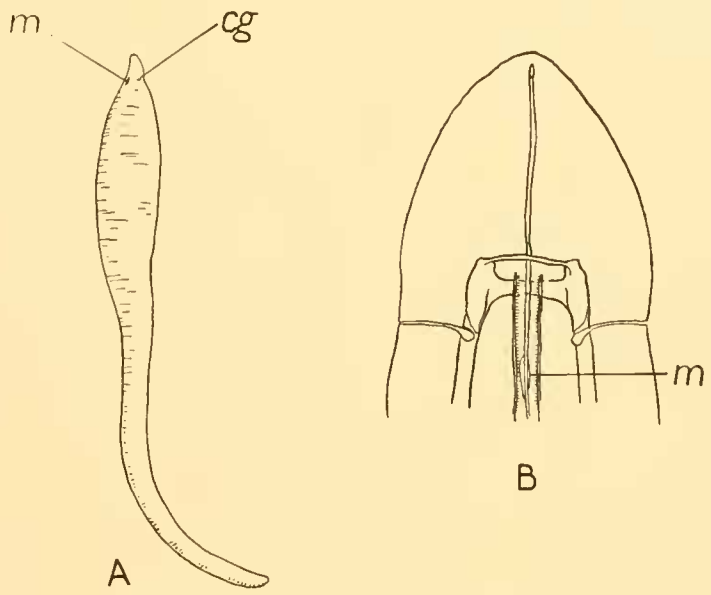

Fig. 21. *Parapolia grytvikenensis*, n.sp. A, sketch of preserved specimen; *m*, mouth; *cg*, cephalic slit. B, outline of the head (from above) from a graphic reconstruction showing the brain, cerebral organs, and the position of the mouth (*m*).

Anatomy. Frontal organs are present but head glands appear to be completely missing. The proboscis pore is a narrow slit placed ventrally not far from the tip of the head. Before its appearance in transverse section the vascular lacunae are present.

The body layers can be seen in Fig. 22. The glands in the cutis are few and inconspicuous. The epithelium is thin. The slender proboscis has definitely the Lineid arrangement of muscle layers.

The brain is small and ill-defined, the fibrous part mingling with the muscles. The cerebral organs are also small. They lie close above the ventral ganglia where these are passing laterally into the lateral nerves. I could trace no direct connection between the cerebral organs and the dorsal ganglia. The organs open to the exterior by fine lateral canals (Fig. 21 B).

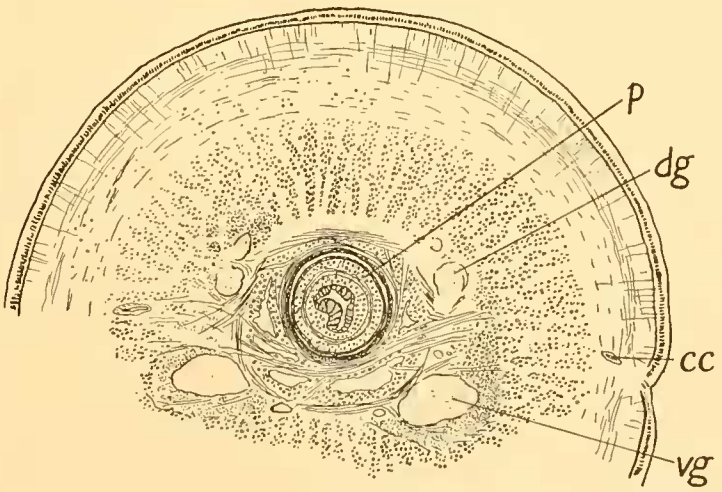

Fig. 22. *Parapolia grytvikenensis*, n.sp. Part of a transverse section of the head at the posterior end of the brain. *cc*, cerebral canal; *dg*, dorsal ganglion; *p*, proboscis; *vg*, ventral ganglion.

The anterior end of the mouth follows directly the disappearance of the cerebral organs from transverse sections. There are no eyes.

The identification of this specimen with the genus *Parapolia* rests on the Lineid structure of the proboscis and the absence of head slits. The specific name is taken from Grytviken, the name of the original headquarters of the whaling industry of the South Atlantic, in Cumberland Bay, South Georgia.

Genus Lineus, Sowerby

Lineus corrugatus, McIntosh, 1887 (Plate XVI, figs. 16, 19, 20, 21; Figs. 23–27).

Cerebratulus corrugatus (McIntosh), Hubrecht, 1887; *C. steinini*, *C. validus*, *C. subtilis*, Bürger, 1893; *C. magelhaensicus*, Bürger, 1895; *C. Charcoti*, Joubin, 1908; *Lineus autrani*, Joubin, 1908.

Some hundreds of Lineid worms conforming in life to the type *L. corrugatus*, McIntosh, were taken from South Georgia and others were collected at stations made off the Falklands and the South Shetland Islands. A great number were examined alive and notes and sketches made of them at the time. A number of methods were used in fixing and preserving them. Identification with the descriptions given by earlier workers has proved a difficult task, and the conclusion I have reached is that there is one species present, widely distributed and very common in this part of the Southern Ocean and as variable in form, colour and size as *L. ruber* of European waters.

The following description covers the external appearance of all the specimens in life.

The length is from a few centimetres to fifty or more at South Georgia. Considerably larger specimens were collected at the South Shetlands. When in motion a 52 cm. worm was 3 mm. across the broadest part of the head; a 17·5 cm. worm was 1·5 mm. across the body.

The colour varies from light fawn to greyish black through all shades of fawn, light reddish brown, greenish brown, dark red-brown and brownish black. The ventral side is nearly always paler than the dorsal. Two white tags from near the posterior ends of the cephalic slits pass upwards. The incomplete band thus formed is occasionally complete and very rarely double. Sometimes the tags are faintly marked and sometimes they are absent. The tip of the snout is white, and the cephalic slits are lined with white. The white lining may extend the whole length or it may stop at the tags. The body colour usually fades towards the tail. The colour of the head may be slightly greenish and sometimes a reddish patch may be apparent on the body just posterior to the head. Occasionally there is a trace of a light median line on the snout. The cephalic slits have a white granular appearance inside and a trace of red at the hinder end. Irregular light transverse wrinkles are present especially towards the posterior end.

The body is slightly flattened. The head is distinctly flat and somewhat wedge-shaped. A "neck" is visible when the animal is moving. The mouth is large and no traces can be seen of pigmented eyespots. The darker colours are more general in the smaller worms, and the white tags, besides being very much more evident by contrast, appear to be invariable.

The specimens in spirit or formalin can be divided into three types: (i) Large pale specimens contracted—often into a spiral with the tail inside—and wrinkled both longi-

tudinally and transversely to a greater or less extent at different parts of the body. The colour that remains is usually stronger dorsally than ventrally (Fig. 23 A). These may have a long slit-like mouth and firm unprotruded lips or the mouth may be a small slit with pursed lips (Figs. 23 B, D, E). (ii) Elongated uncontracted forms of very pale uniform colour, much thinner than type (i). The mouth is very large and the lips are thin, protruded and distorted (Fig. 23 F). (iii) Small specimens coiled spirally with small mouths and pursed lips. The colour is dark and often the same dorsally and ventrally (Fig. 23 C).

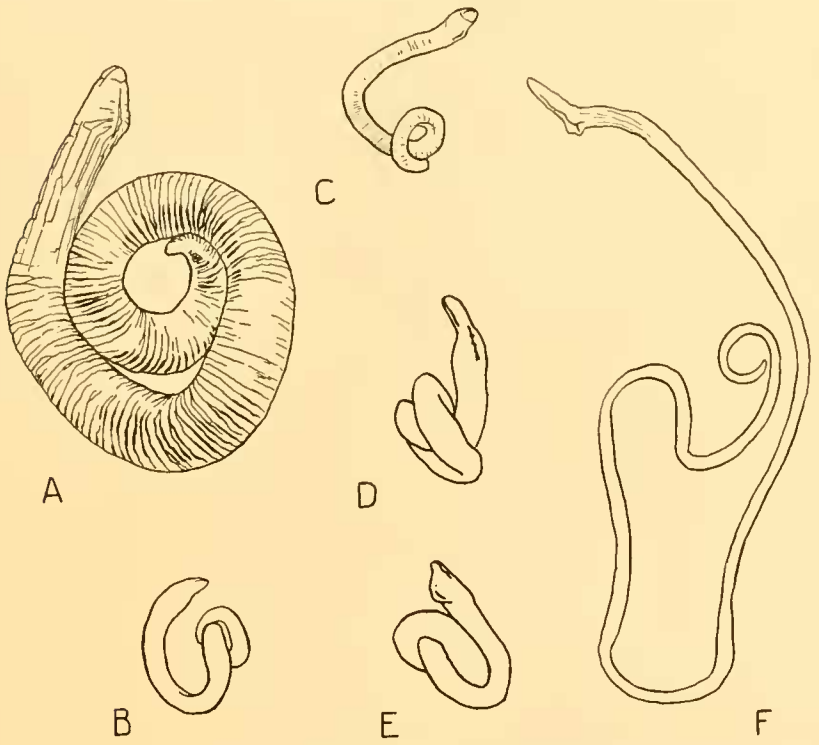

Fig. 23.

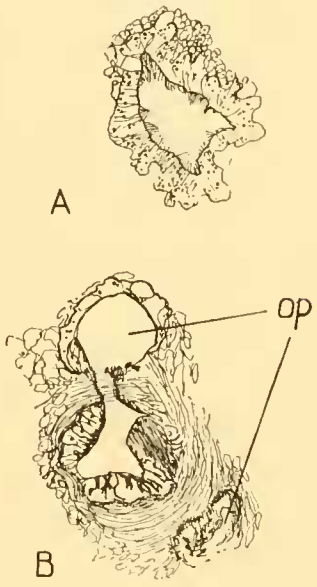

Fig. 24.

Fig. 23. *Lineus corrugatus*, McIntosh. A, preserved specimen of the large type (i); B, E, specimens of type (i) with the mouth pursed, the former from Port Stanley, Falkland Islands; D, specimen of type (i) with the mouth unpursed; C, type (iii); F, the elongated type (ii).

Fig. 24. *Lineus corrugatus*, McIntosh. A, transverse section of the rhynchodaeum near the proboscis pore; B, section of the rhynchodaeum farther back than A, showing the outpushings (*op*). × 175.

That these differences were not discernible in life can be judged from the fact that the different types were sometimes preserved together from the same haul which suggests individual reactions to the fixing fluids. In April 1927 many brownish, reddish and black specimens were dredged from red algae and stones in King Edward Cove. There was no apparent difference in shape, although it was noticed that the brown forms were perhaps rather stouter in build than the others. The roots and worms were left outside the Biological Station for the night, during which the surface water in the pan froze after being mixed with snow. On the following day some of the worms had relaxed and taken on the appearance of type (ii), but on killing with hot water they contracted to the type (i) like the remainder of the catch.

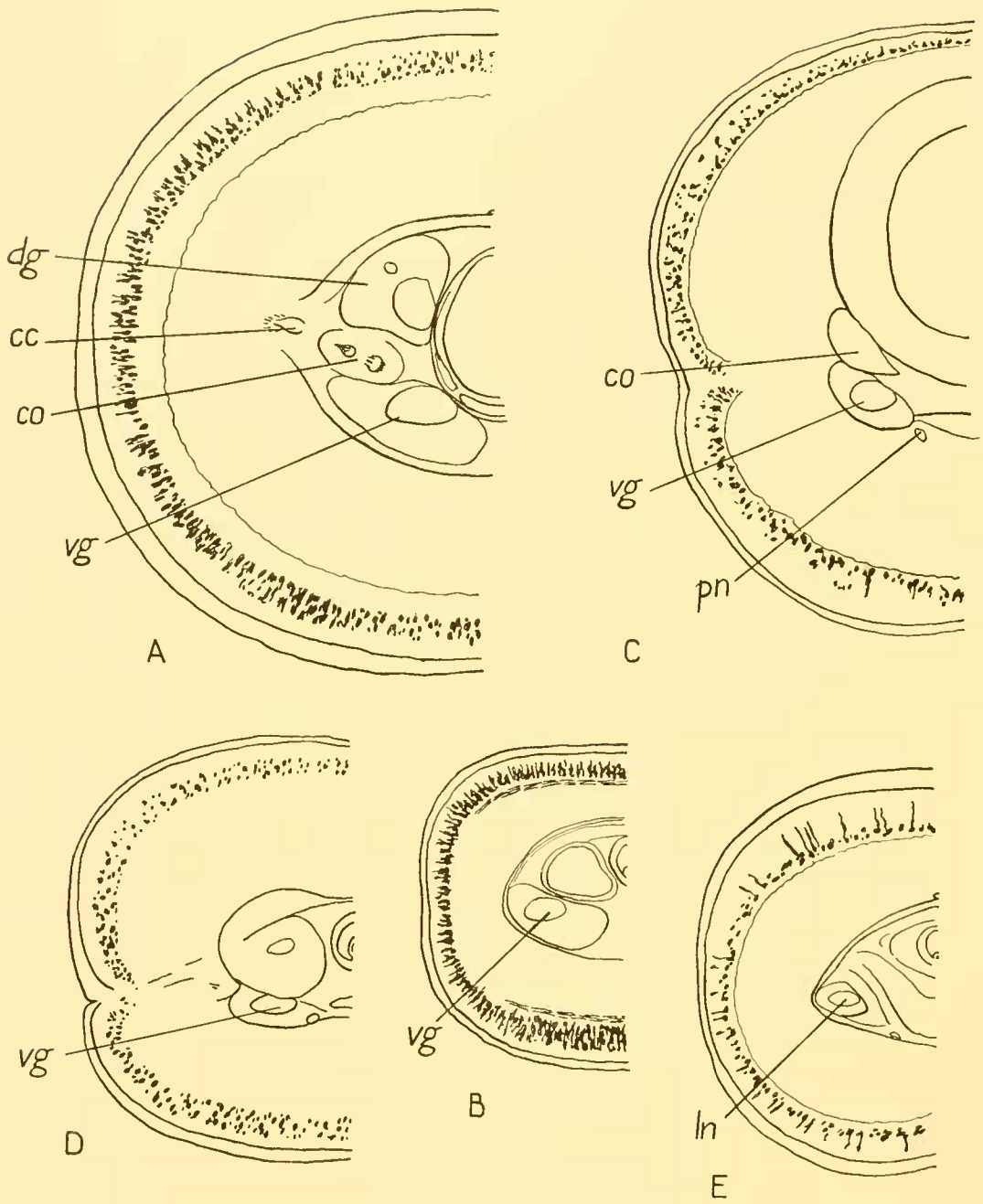

Fig. 25. *Lineus corrugatus*, McIntosh. A series of diagrammatic half-sections at the level of the extreme anterior end of the mouth. A, type (i); B, type (i) corresponding to B of Fig. 23; C, type (iii); D, type (i) corresponding to D and E of Fig. 23; E, type (ii). *cc*, cerebral canal; *co*, cerebral organ; *dg*, dorsal ganglion; *ln*, lateral nerve; *pn*, pharyngeal nerve; *vg*, ventral ganglion.

An investigation was made of the length of the mouth and of the cephalic slits relative to the body length in the preserved specimens with the interesting result that the apparently very large mouth of type (ii) is actually smaller for the length of the animal than it is in either of the other types.

Internal anatomy. Frontal organs are present. The head glands are thin and scattered. They stain with haematoxylin and near the tip of the head are grouped into three areas. They do not reach the brain. The vascular and nervous systems have been well described by previous authors. In the rhynchodaeum there are outpushings noted by Joubin and considered by him to connect the blood lacunae with the exterior. Although they pro-

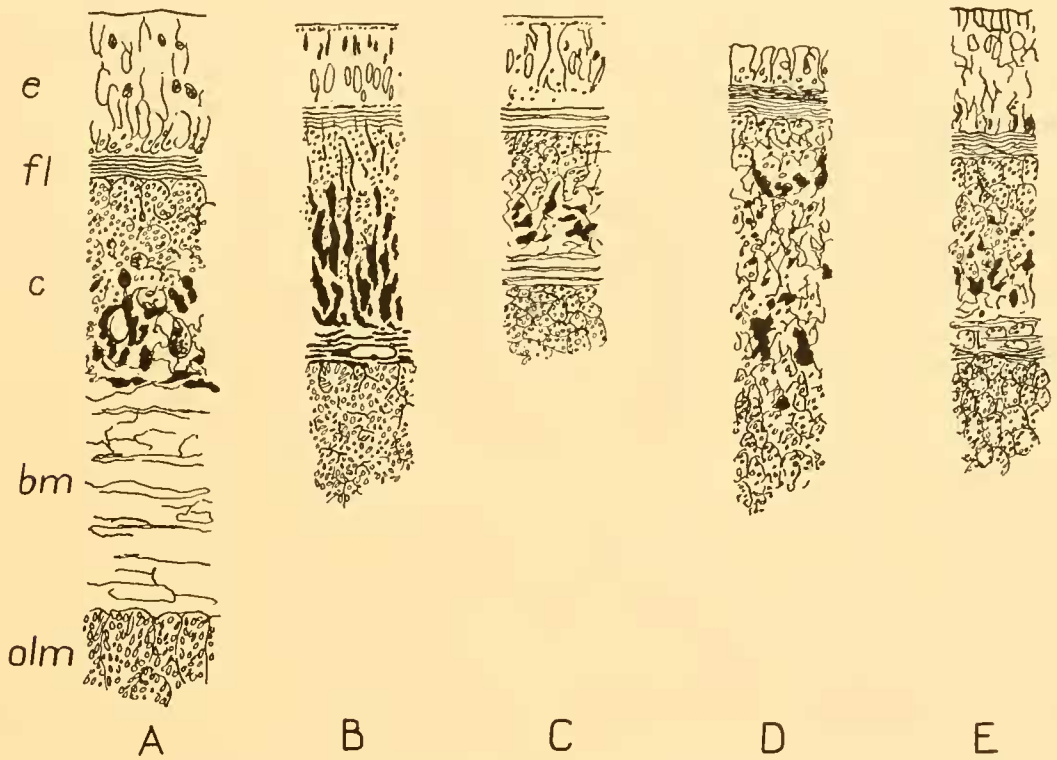

Fig. 26. *Lineus corrugatus*, McIntosh. The dorso-lateral epidermal layers in transverse section. Reference letters as in Fig. 25. *bm*, basement membrane; *c*, cutis; *e*, epithelium; *fl*, fibrous layer; *olm*, outer longitudinal muscles.

trude into the lacunae I have not been able to find any gap in the intervening tissue that would suggest free communication. These outpushings vary in number but have been seen in all types (Fig. 24).

The divergences in the anatomy of the three types are connected with the relative position of the organs (Fig. 25) and in the gland cells of the cutis and the cutis itself. Fig. 26 shows the forms of the dorso-lateral cuticular layers at the level of the anterior end of the mouth. Type (i) possesses the thick muscle-free basement membrane of *Cerebratulus charcoti*, and of *C. corrugatus* as described by Bürger (1904, p. 96); type (iii) the thinner layer with circular fibres of *C. steinini*. A second series of type (i) shows

the structure described in *C. validus*, Bürger. During the examination of the material by means of hand sections cleared in anilin oil it was generally found that the basement membrane conformed to type, but sometimes it did not. On cutting diagonal and longitudinal sections an explanation, based on the contraction of the muscles of the body, was found to cover the differences. When the body is contracted the cutis is thrown into circular wrinkles between which the basement membrane is compressed, giving the appearance of type (iii), while where the cutis bulges the type (i) cross-section occurs.

No eyespots could be seen on clearing in anilin oil. In the sections, however, a series of curious organs can be observed close to the cephalic slits (Fig. 27). These are spherical bodies that produced the granular appearance of the inside of the slits in the living animal. They may possibly have visual function although they appear very similar in structure to fibrous nerve tissue.

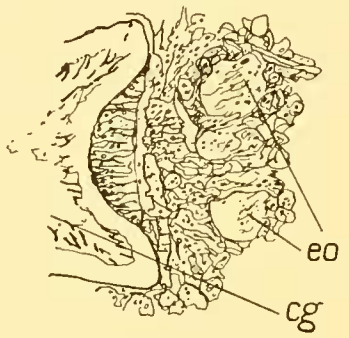

Fig. 27. *Lineus corrugatus*, McIntosh. Part of a transverse section of the head at the base of the cephalic slit, *cg*, to show the spherical granular bodies, *eo*.

I give below a list of the stations at which specimens were captured with the serial numbers of the specimens of which special investigation was made and sections cut. As I have remarked this species is common in the area and a large number of specimens not included in the list below were taken from King Edward Cove and also from Port Stanley Harbour, Falkland Islands, under stones at low tide.

List of stations at which *Lineus corrugatus* was taken. The dates, positions and depths of these stations will be found in the list of stations on pp. 220–5.

Station	Gear	No. of specimens	Serial number	Station	Gear	No. of specimens	Serial number
St. 39	OTL	18	—	St. WS 73	OTC	6	N 128
St. 45	OTL	4	N 134	St. WS 77	OTC	2	N 88, N 89
St. 51	OTL	16	N 126	St. WS 79	OTC	1	N 124
St. 53	RM	8	N 132	St. WS 80	OTC	1	—
St. 123	OTL	1	—	St. WS 84	OTC	4	—
St. 160	DLH	1	N 71	St. WS 88	OTC	2	N 133
St. 163	BTS	1	—	St. WS 225	OTC	2	N 61, N 95
St. 164	BTS	1	—	St. WS 228	OTC	1	N 55
St. 167	N 7–T	3	N 101		NCS–T	2	N 113, N 86
	N 4–T	5	—		N 4–T		
St. 173	BTS	2	—	St. WS 237	NCS–T	2	N 74, N 51
St. 186	DLH	1	—	St. WS 246	OTC	1	—
St. 195	OTM	1	—	St. WS 248	OTC	1	—
St. WS 25	BTS	42	—	St. WS 249	DLH	2	N 66, N 67
St. WS 56	NH	3	—	St. MS 68	NRL	1	—
St. WS 62	BTS	6	—				

Lineus longifissus (Hubrecht).

Cerebratulus longifissus, Hubrecht, 1887.

One hundred and thirty-four fragments including eleven heads and four tails were preserved at St. 167 (N 81, N 81*a*). Fourteen complete worms were examined later. They had been caught in another net at the same station.

Two worms were reconstructed from reddish backed fragments giving approximate lengths of 7·0 cm. The breadth and depth were 0·7 and 0·35 cm. respectively.

The colour of the spirit specimens is reddish or greyish on the back and pale grey or white beneath. The body is flattened, anterior end more cylindrical than posterior, and the tail is pointed. The surface of the skin shows slight circular wrinkling especially anteriorly. As remarked by Hubrecht the mouth is small and the cephalic slits very long. They become shallower gradually, but appear much more sharply cut than in other Lineids. The following measurements were made of complete worms and fragmented heads.

Length of fragment from tip of head cm.	Greatest breadth cm.	Length of cephalic slits cm.	Length of mouth cm.	Distance from tip of head to anterior end of mouth cm.
3·9	0·45	2·1	0·225	0·55
3·3	0·625	2·7	0·20	0·65
2·55	0·5	1·9	0·05	0·45
3·5	0·6	2·05	0·15	0·7
3·5	0·5	1·8	0·05	0·45
4·1	0·45	1·65	0·06	0·6
Complete worm				
5·8	0·43	1·6	0·1	0·4
5·25	0·45	1·6	0·07	0·5

I can add the following notes to the account given by Hubrecht. Frontal organs are present. Head glands are diffuse, stain with haematoxylin and do not reach the anterior end of the brain. The small cephalic canals pass from the fissures just after the level of the ventral commissure. Before they penetrate the brain a dorsal branch is given off by the dorsal ganglion. This branch is extremely short. The posterior lobes of the brain lie in a blood sinus.

One of the characters of the species is the very marked power of autotomy.

Lineus roseocephalus, n.sp. (Plate XVI, fig. 24).

With the dark brown *L. corrugatus* collected under stones in the harbour of Port Stanley, Falkland Islands, was this light red form represented by a single specimen (N 22) 45·0 mm. long and about 1·0 mm. in diameter. In addition to the colour, differences from *L. corrugatus* were readily perceptible in the tapering shape of the body and the rounded anterior end. No mouth was visible but the cephalic slits were very

long. The tip of the head was brown and the anterior end of the body was of a more crimson tint than the body farther back.

Anatomically the worm is very closely allied to *L. corrugatus*. The "eyes" are not present, however, and the mouth is very small.

Genus Cerebratulus, Renier

Cerebratulus larseni, n.sp. (Plate XVI, fig. 8; Fig. 28).

One specimen, somewhat damaged at the posterior end, was taken at St. 140 in 122–136 m. The length was 2·3 cm., breadth 0·14 cm.

The body is round in section but the head is flat. In outline from above it takes the form of an elongated lozenge. The mouth is a small longitudinal slit with swollen lips just behind the pinkish blotch on the head. The colour is pale yellow with a bright pink vague patch on the head and a pink line showing down each side of the body. A caudal appendage is present.

In spirit the specimen had broken up. The colour was bleached.

The head is rectangular in the early sections. The vascular and nervous systems conform to type but the upper branch of the dorsal ganglion is stout and short. It is separated at its distal end from the rest of the ganglion (Fig. 28). The longitudinal muscle layer of the body is strongly developed. The cutis is thin in comparison with the same layer in *Lineus corrugatus*. The basement layer is as thick as the subepithelial muscle layer.

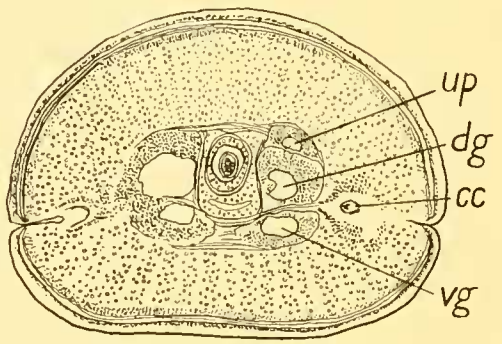

Fig. 28. *Cerebratulus larseni*, n.sp. Transverse section of the head in the posterior brain region. *cc*, cerebral canal; *dg*, dorsal ganglion; *up*, upper branch of the dorsal ganglion; *vg*, ventral ganglion.

I have named this species after Captain C. A. Larsen, the pioneer of whaling in the South Atlantic.

Cerebratulus malvini, n.sp. (Figs. 29, 30).

Certain of the Heteronemerteans from the area around the Falkland Islands possessed a caudal appendage. These worms were not sketched or noted in life so that the colour remains unknown. As far as one can judge from specimens in alcohol (N 52, N 65, N 72, N 97, N 100) the colour is very dark brown, darker on the back than the underside. No trace of markings remain. The lengths and breadths of four specimens are as follows: 36·0, 3·5 mm.; 11·0, 1·0 mm.; 55·0, 2·0 mm.; 45·0, 3·5 mm.

The cephalic slits are long and the mouth is very small. In one specimen (N 52) the caudal appendage was double (Fig. 29B). Apart from the absence of "eyes" there appears to be no feature by which one can distinguish the sections of these worms from

Lineus corrugatus. The cephalic slits are wider and larger altogether (Fig. 30), and this, with the absence of "eyes" and presence of a caudal appendage characterize the species.

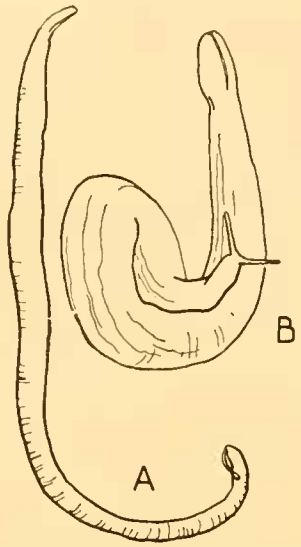

Fig. 29. *Cerebratulus malvini*, n.sp. A, B, outline sketches of preserved specimens.

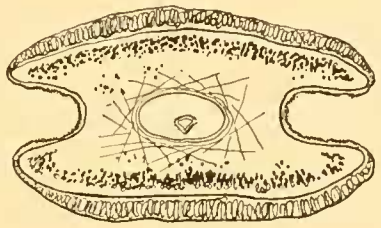

Fig. 30. *Cerebratulus malvini*, n.sp. Transverse section of the head near the tip showing the wide cephalic slits.

The specimens were taken at the following WS stations: 73 (N 52), 228 (N 100), 239 (N 72), 246 (N 97), 249 (N 65).

Order HOPLONEMERTEA

Genus Amphiporus, Ehrenberg

Amphiporus falklandicus, n.sp. (Fig. 36 D).

This species is represented by a number of specimens. It is closely related anatomically to *A. gerlachei*, Bürger and *A. lecointei*, Bürger. I have separated them on the following grounds: the colour in life from a single colour note; the size and shape of the preserved specimens and the position of the junction of the oesophagus and stomach with relation to the brain.

The station numbers and details of gear and depth, with the length, breadth and serial numbers of the specimens are given in the table below:

St.	Date	Gear	Depth m.	Length mm.	Breadth mm.	Serial no.
WS 84	24. iii. 27	OTC	75–74	—	—	—
WS 97	18. iv. 27	OTC	146–145	55·0	3·3	N 122
WS 225	9. vi. 28	OTC	162–161	48·0	2·5	N 62
				36·0	4·0	N 96
WS 228	30. vi. 28	OTC	229–236	47·0	4·8	N 84
				40·0	4·0	N 85
				36·0	2·5	—
WS 246	19. vii. 28	OTC	267–208	11·0	2·0	N 98
WS 248	20. vii. 28	OTC	210–242	—	—	—

The body is more elongated and slender than that of *A. gerlachei*, though the posterior end of the body is flattened as in this species (Fig. 36D). The anatomy is similar except that the oesophagus does not open into the stomach until after the brain. This is similar to *A. lecointei*, but from this form *A. falklandicus* differs in colour and shape. There are twelve nerves in the proboscis and an accessory armature of two reservoirs with from two to six stylets. Head glands and cerebral subepithelial glands are present and the cerebral organs persist behind the dorsal ganglia.

Male and female specimens were included in the collection and the ova of the latter contained the "paranucleus" remarked upon by Hubrecht in *A. marioni*.

Amphiporus gerlachei, Bürger, 1904 *a* (Figs. 31, 36 C).

This species appears to be fairly common, though it was not captured in King Edward Cove and no sketch was made of the living animal. From a colour note and three series of sections I have identified it with *A. gerlachei*, Bürger. Seventeen specimens taken from the base of a large hollow sponge at St. WS 225 were noted as "bright pink" in life (N 94).

The lengths and breadths of preserved specimens were: 35·0, 6·0 mm. (N 63); 35·0, 5·5 mm. (N 64); 30·0, 7·0 mm. (N 94); 40·0, 7·0 mm.; 50·0, 7·0 mm.

The anterior end is cylindrical, the posterior very flat (Fig. 36C). The oesophagus opens into the stomach in front of the brain (Fig. 31). In other ways the anatomy corresponds to that of *A. lecointei*. There are twelve nerves in the proboscis, and the accessory armature consists of two reservoirs with from two to five stylets. The sex was determined in one specimen only—a male.

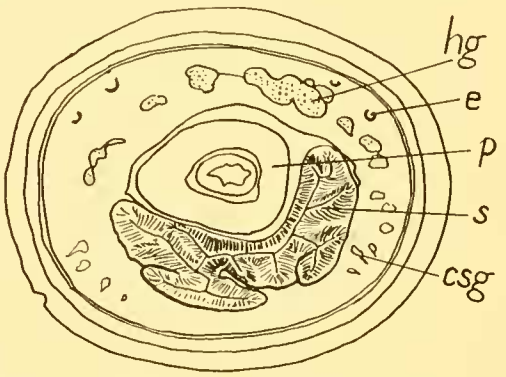

Fig. 31. *Amphiporus gerlachei*, Bürger. Transverse section of the head in front of the brain. *csg*, cerebral subepithelial glands; *e*, eyespot; *hg*, head glands; *p*, proboscis; *s*, stomach.

A. gerlachei was taken at the following WS stations:

WS 225. 9. vi. 28. OTC, 162–161 m. (N 94).
WS 246. 19. vii. 28. OTC, 267–208 m.
WS 249. 20. vii. 28. DLH, 166 m. (N 63, N 64).

Amphiporus inexpectatus, n.sp. (Fig. 32).

This species is represented by serial sections of a single specimen (N 108) taken at St. WS 231 off the Falkland Islands and not noted in life. The preserved specimen was 16·0 mm. long and 2·0 mm. in diameter, round in section and bleached of all colour. The proboscis was protruded but no armature could be made out after clearing.

Anatomy. The head glands open at the tip of the head above the proboscis pore. They form a thick strand close to the rhynchocoel and do not stain with haematoxylin (Fig. 32). They disappear before the brain. The epithelium at the level of the posterior

end of the stomach is about twice as thick as the basement layer which is considerably thicker than the circular muscle layer. The longitudinal muscles are well developed.

There appears to be no distinction between oesophagus and stomach. A large folded tube passes through the region of the brain and opens by a frilled mouth under the proboscis pore. The tube enlarges slightly posteriorly. Branches of the anterior caecum reach the brain.

The proboscis possesses thirteen nerves and is stout and muscular. There is no dorsal strand in the lateral nerves. The cerebral organs are small and only just reach the brain. Their short canals open ventro-laterally. There are about fifteen eyespots on each side. The specimen was a male with immature testes.

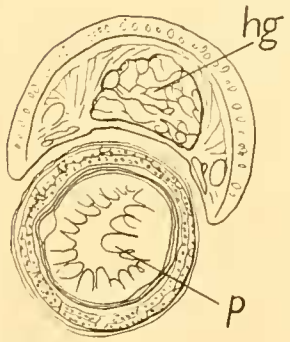

Fig. 32. *Amphiporus inexpectatus*, n.sp. Transverse section at the extreme tip of the head with the protruded proboscis, *p*. *hg*, head glands.

I have separated this worm from the other Amphiporids on the nerves in the proboscis and the position and size of the cerebral organs.

Amphiporus lecointei, Bürger, 1904 *a* (Plate XVI, fig. 9; Figs. 33–35, 36 B).

This species was taken at the following stations:

St. 27. 15. iii. 26. DL, 110 m. 1 (N 114).
St. 140. 23. xii. 26. OTL, 122–136 m. 4 (N 45).
St. 156. 20. i. 27. DLH, 200–236 m. 2.
St. 158. 21. i. 27. DLH, 401 m. 2.
St. 159. 21. i. 27. DLH, 160 m. 4.
St. 195. 30. iii. 27. OTM, 391 m. 2.
St. WS 25. 17. xii. 26. BTS, 18–27 m. 2 (N 120).
St. WS 93. 9. iv. 27. N 7–T, 133–130 m. 6 (N 125).
St. MS 71. 9. iii. 26. NCS–T, 110–60 m. 1 (N 115).

One specimen (N 45) was examined and sketched in life and afterwards sectioned. This, though similar in many respects to *A. michaelseni*, Bürger, has been separated from it by reason of the cerebral organs, armature and the number of nerves in the proboscis. It has been identified with *A. lecointei*, Bürger, on the shape, head glands, brain and cerebral organs. Much should have been added to make the original description adequate, for there is great similarity in the anatomy of the closely related species *lecointei*, *gerlachei*, *falklandicus* and *marioni*.

The length was 20 mm. and breadth 2·3 mm. A specimen sketched by Mr D. D. John at St. 156 was 23 mm. long.

Form and colour in life. The size and shape is remarkably uniform. The body is stout, almost circular in cross-section, bluntly pointed at the head and tapering to the tail. The head is marked off from the body by a transverse groove deep ventrally and incomplete dorsally. At each side the groove takes the shape of a backwardly directed V, and from

it ventrally there are several furrows passing forward upon the head (Fig. 33 B). The opening of the head gland can sometimes be seen at the tip of the head: the larger opening of the rhynchodaeum is subterminal.

There is a semi-lunar group of about twenty deeply embedded eyespots showing palely through the skin passing outwards on each side from the tip of the head along the margin and turning medially. Following these eyespots there is a deep closely-set posterior group of eyes behind the cephalic furrow of each side (Fig. 33 A).

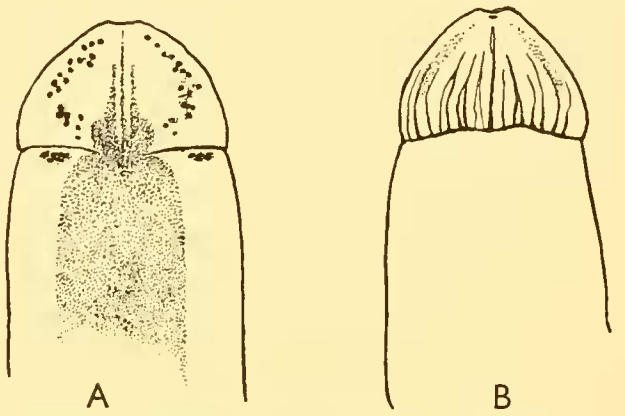

Fig. 33. *Amphiporus lecointei*, Bürger. A, dorsal, and B, ventral sides of the head.

The distinctive marking of the species is a broad brownish red band down the back extending on to the head. The edges of the body and the underside are uncoloured.

Form and colour of preserved specimens. The stout body does not twist much. Often the ventral side is more convex than the dorsal and there is a tendency for the body to curl with the dorsal surface inside. Occasionally the ventral surface is flat or concave while the dorsal is humped. The proboscis is usually protruded. It is nearly the same length as the body. The colour can in some specimens be traced as a grey band. The eyespots are large. On clearing, the anterior group can be seen to consist of 10–20 on each side opening forward, the posterior of 16–18 opening laterally or posteriorly.

Anatomy. The basement membrane stains somewhat with haematoxylin and is nearly as thick as the epithelium, which is itself very thick. Each of these layers is four to five times as thick as the circular muscles. The longitudinal muscles are thick and show a marked pennate arrangement of the bundles (cf. *A. marioni*, Hubrecht). There are subepithelial glands in the head confined to lateral tracts from the tip to just beyond the cerebral canals. These I propose to call cerebral subepithelial glands. They differ in appearance and staining reaction from the head glands and their ducts can be seen traversing the body layers direct to the exterior (Fig. 34). The head glands just reach the brain. They are compact strands opening by a median pore at the tip of the head.

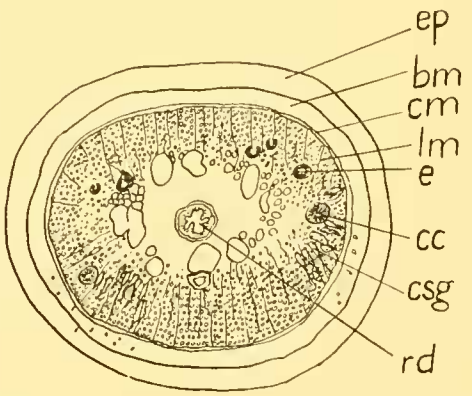

Fig. 34. *Amphiporus lecointei*, Bürger. Transverse section of the tip of the head. *bm*, basement layer; *cc*, cerebral canal; *cm*, circular muscle layer; *csg*, cerebral subepithelial glands; *e*, eye; *ep*, epithelium; *lm*, longitudinal muscle layer; *rd*, rhynchodaeum.

The proboscis is thin and is attached at about

half the length of the body, but the rhynchocoel extends to the tail. The proboscis has twelve nerves. The armature consists of a main stylet on a base not longer than itself and two reservoirs, each with from four to seven stylets.

The relative positions of the stomach, excretory organs and branches of the anterior caecum are believed to vary with the degree of contraction of the body. Thus in one series of sections the stomach wall is visible some distance before the brain, showing that the alimentary canal has the power of independent movement and that not much reliance can be placed in distinguishing characters based on position. The anterior caecum has branches which are first seen close behind the excretory tubules (Fig. 35).

The vascular system consists of two lateral vessels forming a head loop and passing one on each side of the rhynchocoel through the brain region. They unite with a dorsal vessel by a transverse connection and pass down the body ventral to the nerves.

There is a convoluted excretory tubule on each side close behind the cerebral organ, lying above the nerve and opening to the exterior by a single dorso-lateral duct.

The brain is of good size. The dorsal ganglia are larger than the ventral and lie immediately over them. At the posterior end of the ventral ganglia there may be a con-

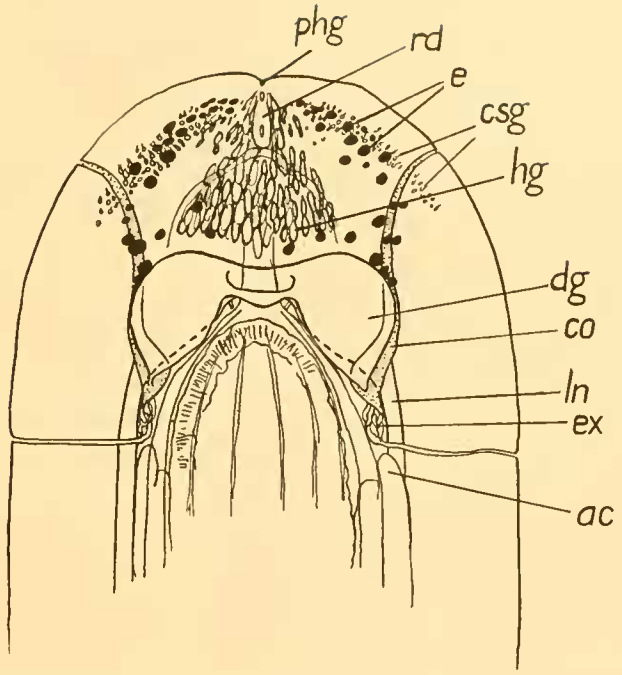

Fig. 35. *Amphiporus lecointei*, Bürger. Diagram from a graphic reconstruction of the head and anterior end of the body to show the relations of the brain, cerebral organs, excretory and alimentary systems. *ac*, anterior caecum; *co*, cerebral organ; *csg*, cerebral subepithelial glands; *dg*, dorsal ganglion; *e*, eye-spots; *ex*, excretory tubule; *hg*, head glands; *ln*, lateral nerve; *phg*, opening of the head gland; *rd*, rhynchodaeum.

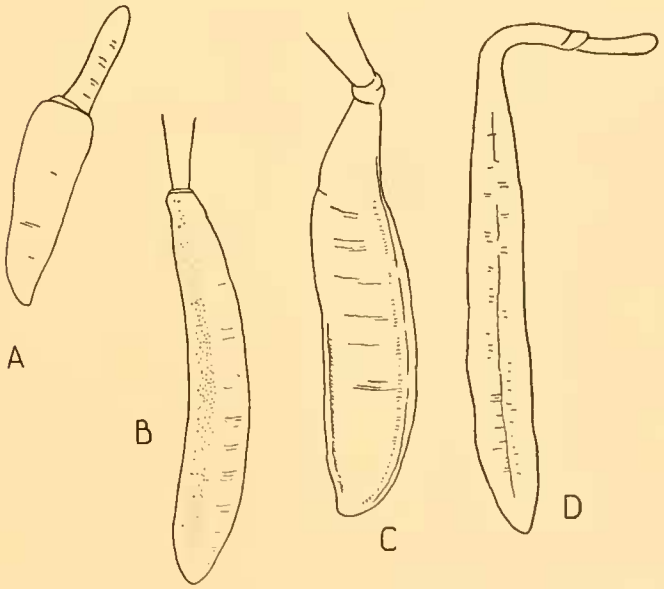

Fig. 36. Outline drawings (× 3 approx.) of *Amphiporus marioni* (A), *A. lecointei* (B), *A. gerlachei* (C), and *A. falklandicus* (D).

traction twist when they become the lateral nerves. No dorsal strand could be detected in the lateral nerves. The cerebral canals are short. Their openings are ventro-lateral. The organs themselves are large and at first closely applied to the sides of the dorsal ganglia. Fibres from the ganglia pass into them and form the only connection. They shift ventrally, wedging themselves between the dorsal and ventral ganglia. On the disappearance of the dorsal ganglia the organs also diminish and end. Fig. 35 shows the relative positions of the various organs in the head from a graphic reconstruction. Reference to Fig. 37 will show how closely the main anatomical features of this species resemble those of *A. marioni*, allowing for the greater degree of contraction in the latter and the fact that the proboscis is considerably thicker. In Fig. 36 outline drawings of spirit specimens of the four species are given illustrating the differences in shape of the body. *A. lecointei* should be easily recognized in life by its distinctive form and colour.

Amphiporus marioni, Hubrecht, 1887 (Figs. 36A, 37, 38).

One specimen (N 5) was taken from a kelp root from King Edward Cove. It was not sketched until the following day when it was sorted from *A. moseleyi* with which it had been fixed. The colour and general appearance are probably very similar. The length was 9·3 mm., the breadth 1·5 mm. (in spirit).

The small stoutly built body is flattened posteriorly. No eyes can be seen (Fig. 36A).

Anatomy. In the region of the stomach the longitudinal muscle layer is three or four times as thick as the epithelium. Farther back down the body it is less than twice as thick and in some positions—mid-ventrally under the gut and mid-dorsally—it is thinner than the epithelium. The basement membrane is very thick and appears fibrous.

The head glands are large and compact. One strand, dorsal to the rhynchocoel, opens by a pore ventral to the tip of the snout. This strand does not reach the dorsal commissure. There are two lateral strands, one on each side of the rhynchocoel, which extend back ventral to the brain as far as the ventral commissure and opening of the cerebral canals (Fig. 37). There are cerebral subepithelial glands on each side from the tip of the head to the cerebral organs. About fifteen eyespots with very light brown pigment are present on each side.

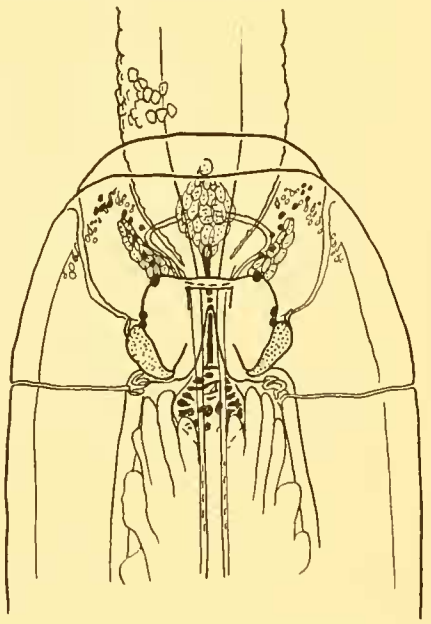

Fig. 37. *Amphiporus marioni*, Hubrecht. Graphic reconstruction of the anterior end of the body.

The oesophagus opens into the rhynchodaeum before the brain and at the level of the cerebral organs it becomes the stomach. The anterior caecum is much branched and the branches extend forwards and approach the posterior end of the brain. The lateral diverticula of the gut extend above the lateral nerves (Fig. 38). The proboscis is thick. There are fifteen nerves. The armature consists of a main stylet

and two accessory stylet reservoirs with one or two complete stylets and a number of fragments. The rhynchocoel extends to the posterior end of the body. The vascular and excretory systems are similar to those of *A. lecointei*.

The brain is small. The dorsal ganglia are considerably larger than the ventral and lie immediately over them. At the posterior end of the ventral ganglia the lateral nerves are given off sharply at right angles to the long axis of the body (Fig. 37). They appear to double upon themselves again just after turning down the body. The twists are vertical, instead of lateral as described in *A. moseleyi*, and are plainly the effects of contraction. The cerebral canals are short. Their openings are ventral and lateral into a deep circular groove near the tip of the head. The organs themselves are large and closely applied to the sides of the dorsal ganglia, but posteriorly they push between dorsal and ventral ganglia and extend back beyond the former.

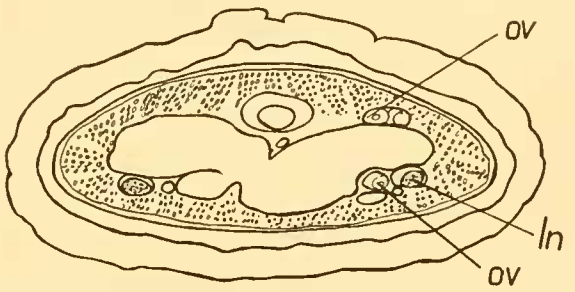

Fig. 38. *Amphiporus marioni*, Hubrecht. Transverse section of the body at about half its length. *ln*, lateral nerve; *ov*, gonad.

The generative sacs (female) are both dorsal and ventral to the gut branches and the nuclei of the ova contain a deeply staining nucleolus. The "paranuclei", as described by Hubrecht (1887), are present.

The features that have caused a distinction to be made between this species and *A. gerlachei*, Bürger, which it closely resembles when preserved, are the number of nerves in the proboscis and the colour. A reddish worm would undoubtedly have been separated from the specimens of *A. moseleyi* on capture.

Amphiporus moseleyi, Hubrecht, 1887 (Plate XVI, figs. 3, 18; Fig. 39).

Amphiporus Racovitzai, Bürger, 1904 *a*.

This species (N 4) was very common in King Edward Cove and round the coast of South Georgia. Almost every kelp root sheltered one or more specimens, and a considerable range in colour and size was observed. The largest specimen was 10·2 cm. long and 12·0 mm. broad. Specimens were also taken at the following stations:

St. 123. 15. xii. 26. OTL, 230–250 m.
St. WS 219. 3. vi. 28. NCS–T, 116–114 m. (N 79).
St. MS 67. 28. ii. 26. BTS, 38 m.

Form and colour in life. The usual length is 5–6 cm. and the breadth 7–8 mm. The body is stoutly built and considerably flattened. The ventral surface is flat and forms a broad "sole". The dorsal surface is convex, especially anteriorly where a longitudinal hump marks the presence of the muscular proboscis. There is no distinction of head from body, but the head end is rather less blunt than the tail. In outline the body resembles a willow leaf. No cephalic slits or eyespots are visible. The opening of the

proboscis pore is just ventral to the tip of the snout. The colour is blue-green, yellow-green, pale buff or light brown on the back, while the underside is always pale buff. The colour is deepest in individual worms on the hump caused by the proboscis. Occasionally a reddish tinge marks the position of the ganglia and a narrow whitish stripe at the margin of the body anteriorly the lateral glands.

Form and colour of preserved specimens. After anaesthetization in chloral hydrate very little contraction appears to take place on fixing. The green colour is retained in spirit specimens for many months. The body does not change in shape but contraction causes two grooves to appear, one near the tip of the head, the other a little farther back. When only slightly marked these grooves take the form of two pairs of short lateral vertical furrows. Two irregular groups of very small eyespots—up to sixty—can be seen when the head has been cleared in anilin oil. The eversible part of the proboscis is apple green in colour.

The anatomy of this species has been described by Hubrecht (1887) and Bürger (1904 *a*, 1907). Variations occur in the following details. The eyespots, though always very small, vary considerably in number, and the pigment granules which they contain are of a deep green-blue colour.

The lateral glands (very strongly developed cerebral subepithelial gland cells) stain deeply with haematoxylin; the head glands less deeply. The number of nerves in the proboscis may be from eleven to sixteen though the usual number is fourteen. The base of the main stylet may be brown or green and there is a belt of brown gland cells round the armature. The base of the main stylet is less than twice as long as the stylet itself. The brain and cerebral organs are shown in Fig. 39. As noted by Bürger (1907 (1912), p. 173) the dorsal ganglia lie laterally rather than dorsally to the ventral. They are, as it were, pressed forwards and outwards so that they are in almost the same plane as the ventral ganglia. In consequence the dorsal commissure is very long. The double twist in the lateral nerves is probably the result of contraction. The cerebral organs, consisting of a narrow canal ensheathed by eosinophile tissue on each side, extend a short way beneath the dorsal ganglia but do not penetrate them.

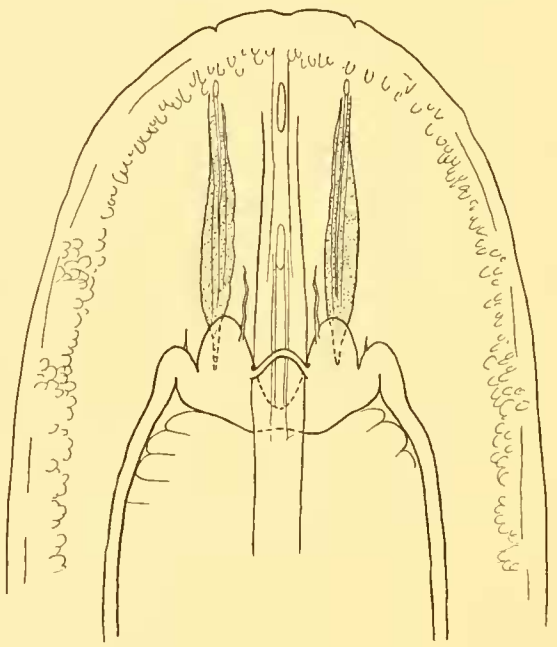

Fig. 39. *Amphiporus moseleyi*, Hubrecht. Diagram of the anterior end of the body showing the brain, cerebral organs, cerebral subepithelial glands and the position of the opening of the rhynchodaeum and the opening of the oesophagus into it.

Amphiporus schollaerti, n.sp. (Figs. 40, 41).

A single specimen (N 58) of a large worm was taken at St. 182 in the Schollaert Channel, Palmer Archipelago. The colour as noted in life was pale buff. The preserved specimen was 97 mm. long, and 5·0 mm. broad. It was almost round in section from one end to the other except the head which was blunt and flat (Fig. 40). There was a pore visible at the tip and a larger aperture just ventral to this. Lateral vertical grooves were also present, joining ventrally. The body was slightly dusky at the sides but otherwise colourless.

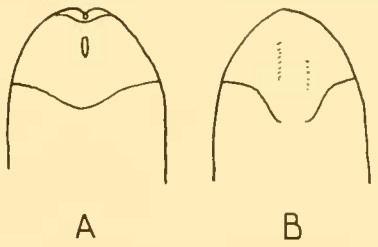

Fig. 40. *Amphiporus schollaerti*, n.sp. A, ventral surface of head of preserved specimen; B, dorsal surface.

The anatomy is similar to *A. lecointei* with the exception of the proboscis which has fourteen nerves. Head glands, cerebral subepithelial glands are present and the cerebral organs occupy a position between the ganglia and extend behind the dorsal ganglia (Fig. 41).

The excretory tubules are large and the anterior caecum has forward branches but they are far behind the brain.

I have separated this worm from the other Amphiporids on its size, colour and innervation of the proboscis. The armature was not seen. The specimen was male.

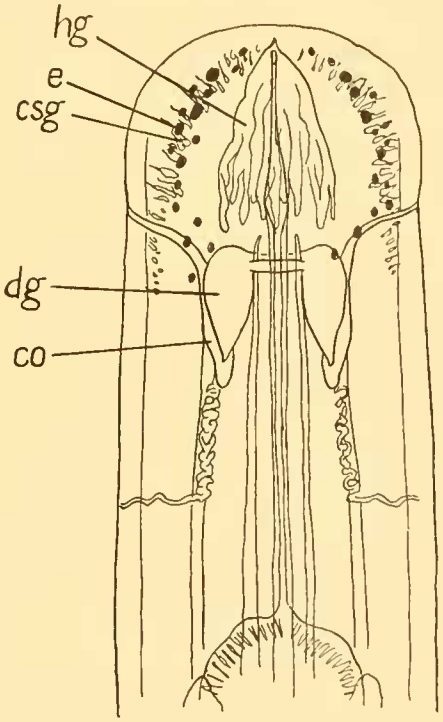

Fig. 41. *Amphiporus schollaerti*, n.sp. Diagram showing the organs at the anterior end of the body. From a graphic reconstruction. *co*, cerebral organ; *csg*, cerebral subepithelial glands; *dg*, dorsal ganglion; *e*, eye; *hg*, head gland.

Amphiporus scoresbyi, n.sp. (Figs. 42, 43).

Three specimens of this small distinctively shaped species were obtained at St. WS 302 (N 77), the colour note being "orange-yellow to orange-red dorsally and ventrally with very pale yellow periphery and proboscis. Darker pigment in midline posteriorly". Two specimens were taken at St. WS 548 and one at St. WS 550. These were of the same size and shape. They had been preserved in formalin and all colour was bleached.

Form and colour of preserved specimens. The body is fusiform, the length 5·5 mm., diameter of the mid-body 2·0 mm. Its surface is thrown into small rounded eminences which at the anterior end form three or four rows of short fimbriae (Fig. 42). The colour is uniformly yellowish with no sign of eyes or markings.

Anatomy. The head glands open at the tip of the head just before the proboscis pore. The glands stain deeply with haematoxylin. The thin strands disappear before the

brain, but anteriorly they fill the head. The oesophagus joins the rhynchodaeum very close to the external opening and is from this point lined with the deeply staining cells characteristic of the stomach. Its walls are folded (Fig. 43). I could see no eyespots in the cleared specimens nor were any evident in the sections. There are no cerebral subepithelial glands, but there are cutis glands in the longitudinal muscles.

The basement layer is very thick and stains lightly. The epithelium in all the specimens is much wrinkled but apparently it is not much thicker than the basement membrane. The circular muscles are less than half as thick. The longitudinal layer is well developed but does not show the pennate arrangement of bundles so noticeable in

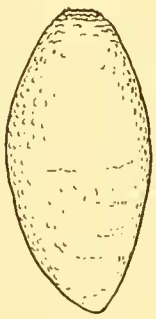

Fig. 42. *Amphiporus scoresbyi*, n.sp. Sketch of a preserved specimen. × 8 approx.

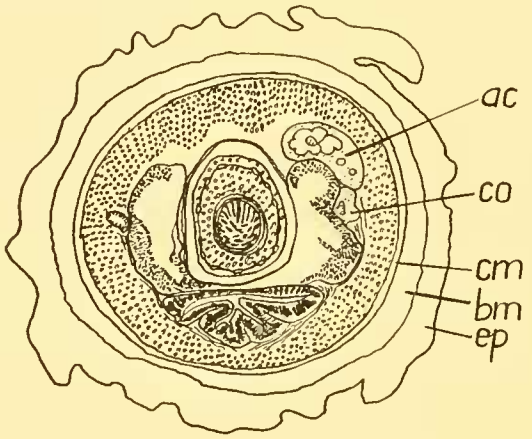

Fig. 43. *Amphiporus scoresbyi*, n.sp. Section, slightly oblique, across the brain region. *ac*, lateral branch of the anterior caecum; *bm*, basement layer; *cm*, circular muscle layer; *co*, cerebral organ; *ep*, epithelium.

A. marioni and other species. The proboscis is stout. It has twelve nerves and the accessory armature consists of two reservoirs each with two or three stylets. The main stylet could not be seen.

Two lateral branches of the anterior caecum extend forward and end above the brain (Fig. 43). The excretory tubules, as usual, lie between the cerebral organs and the branches of the anterior caecum. The efferent duct is continued back above the lateral nerve and opens laterally much nearer the tail than the head.

The brain is of fair size, both ganglia being nearly equal. The cerebral organs open by a fine canal laterally and run in towards the brain obliquely back. The organs wedge themselves between the ganglia and protrude posteriorly beyond the dorsal ganglia with which they have nervous connections. The lateral nerves are not much flattened in the body. They join above the anus.

The sex of the sectioned specimen could not be determined.

Amphiporus spinosus, Bürger, 1893 (Plate XVI, fig. 22; Figs. 44, 45).

A. spinosissimus, Bürger, 1893; *A. cruciatus*, Bürger, 1893; *A. multihastatus*, Joubin, 1914.

This species could nearly always be found in kelp roots. Three types were originally described under N 3, N 16, N 20, the different sizes, number of eyespots, colour and

states of contraction leading to confusion. The length and breadth vary from 25 and 0·8 mm. to 180 and 2·8 mm., though the majority are shorter and broader than the latter.

The body is round, tapering at the posterior end. The snout is broadly acute. There may be no distinction between head and body, or the head may be broader than the broadest part of the body (in the smaller specimens) and two partial lateral furrows may be present, almost vertical in direction, with a chevron groove behind the head. This groove is complete ventrally. Sometimes the aperture of the rhynchodaeum can be seen. The colour is pale pink, pinkish red, brick red, orange or light orange red, usually deeper on the back and anteriorly. Sometimes the underside of the body is much paler than the back. There are two groups of eyespots on each side, often appearing as vague blackish patches.

Form and colour of preserved specimens. The lengths and breadths of a number of specimens are as follows: 51·0, 5·0 mm.; 31·0, 3·2 mm.; 60·0, 4·5 mm.; 85·0, 4·5 mm.; 14·0, 1·8 mm.; 32·0, 1·8 mm.; 130·0, 3·5 mm.

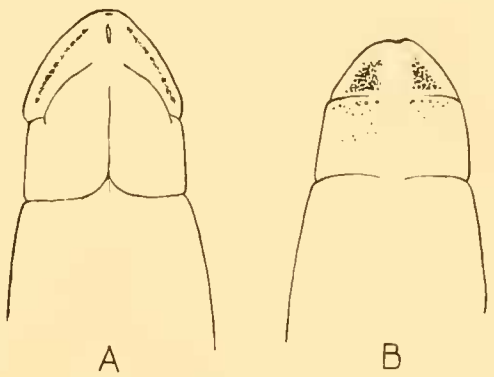

Fig. 44. *Amphiporus spinosus*, Bürger. A, ventral; and B, dorsal surface of head.

The body is round in section, the head blunt and the tail acute. The head is usually marked off from the body by a distinct and almost complete annular groove; dorsally this groove forms a wide V with the apex pointing back (Fig. 44). Anterior to this there are often lateral grooves, as in Fig. 44, and sometimes a median vertical groove in which can be seen the openings of the head gland and rhynchodaeum. The eyes are not all visible unless the specimen is cleared. On clearing two groups of brown cup-shaped eyespots can be determined on each side. The eyes vary from fifty or so in each group to small numbers like seven in the anterior and four in the posterior group of one side. They appear to increase with the size of the worm. The anterior eyes open forwards, the posterior more to the side, and they vary in size. The colour is usually bleached, but sometimes a faint general pinkish tinge is observed.

Anatomy. The head glands open at the tip of the head. There is a main compact dorsal strand which is joined by a smaller ventral strand under the vascular loop just anterior to the opening of the rhynchodaeum (Fig. 45A). The dorsal strand becomes thin and scattered posteriorly and does not extend to the brain. The ventral strand forms an investment to the rhynchodaeum on each side and continues back past the junction with the oesophagus. It, too, disappears before the brain.

The epithelium is very thick. In places it is thicker than basement membrane, circular muscles and longitudinal muscles put together. The basement membrane itself is thick and stains strongly. In the head, at about the level of the cerebral organs, there are eosinophile glands in the longitudinal layer whose ducts pass through the circular layer and basement membrane. These are not seen farther down the body.

The oesophagus is at first thin and small. It expands in the region of the brain into the stomach. Far back there is an anterior caecum with two short forward branches. The vascular system is normal and the excretory tubules occur just posterior to the brain.

The proboscis as far as the armature is almost half the length of the body. The accessory armature and proboscidial nerves vary greatly, though there is always a main stylet mounted on a brownish pear-shaped base (Fig. 45B). The following range of variation has been found:

Serial No.	Length of worm, mm.	Accessory reservoirs	Number of stylets in each reservoir	Number of nerves
N 16	60·0	18	1	—
N 16	90·0	18	1 (2)	14
N 20	14·0	7	1 (2) (3)	—
N 20	32·0	2	3	—
N 20	11·0	6	1	11
N 20	30·0	8	2 (3)	—
N 3	130·0	12	2 (3)	17
—	65·0	14	2 (3)	—
—	60·0	13	2 (1)	—
—	38·0	9	2 (1)	—
—	30·0	8	2 (3)	—
N 3	—	7	—	17
N 3	62·0	18	2 (1)	15
N 3	—	12	2 (1)	15
N 3	—	11	2	15
N 3	—	16	2 (1)	17
N 16	92·0	22	1 (2)	18
N 20	—	5	—	—
N 3	—	—	—	16
N 110	75·0	13	2 (1)	19
N 121	45·0	22	1	—
—	27·0	10	2 (1)	17
N 131	50·0	—	—	17
N 135	95·0	—	—	26
N 136	27·0	13	—	16

It seems evident that no specific value can be given either to the armature or to the proboscidial nerves. There is a possibility of increase with size or age.

The brain is fairly large but does not show any peculiarity. In one series of sections the lateral nerves left the brain by a sharp twist outwards, but this is merely the effect of contraction. The cerebral organs open by two very small pores ventro-laterally behind the opening of the rhynchodaeum. The organs are small and do not reach the brain.

Some of the specimens were males, some females. The gonads are shed laterally both above and below the nerves (Fig. 45D). Eggs were ripe in November and December.

In view of the extreme variation in the accessory armature and proboscis nerves the distinctions that have been drawn on these characters cannot hold. I therefore feel justified in bringing together the species described by Bürger and Joubin under *A. spinosus*, Bürger.

In addition to the collection from King Edward Cove this species was taken at the following stations:

St. 39. 25. iii. 26. OTL, 179–235 m.
St. 45. 6. iv. 26. OTL, 238–270 m.
St. 123. 15. xii. 26. OTL, 230–250 m.
St. 140. 23. xii. 26. OTL, 122–136 m.
St. WS 56. 14. i. 27. NH, 2 m.
St. WS 62. 19. i. 27. BTS, 26–83 m.
St. WS 65. 22. i. 27. Sh. coll.
St. WS 73. 6. iii. 27. OTC, 121–130 m.
St. MS 68. 2. iii. 26. NRL, 220–247 m.
St. MS 71. 9. iii. 26. BTS, 110–60 m.

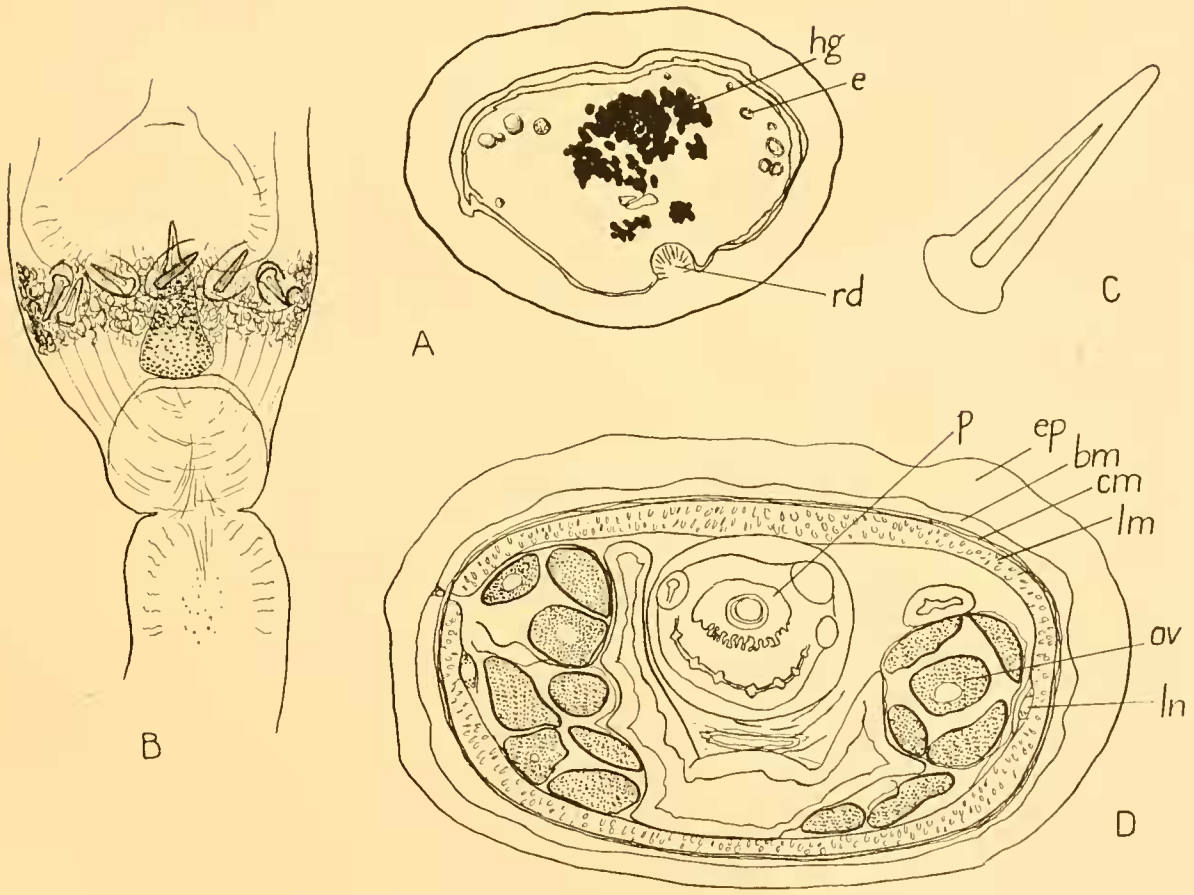

Fig. 45. *Amphiporus spinosus*, Bürger. A, section across the tip of the head; B, armature; C, accessory stylet; D, transverse section of the body. *bm*, basement membrane; *cm*, circular muscle layer; *e*, eye; *ep*, epithelium; *hg*, head gland; *lm*, longitudinal muscle layer; *ln*, lateral nerve; *ov*, gonad; *p*, proboscis; *rd*, rhynchodaeum.

Genus Tetrastemma, Ehrenberg

Tetrastemma esbenseni, n.sp. (Plate XVI, figs. 4, 23; Figs. 46, 47).

This species is not a common one. It occurred as follows:

7. iii. 26. King Edward Cove, South Georgia, 1 (N 18).
9. iii. 26. Maiviken, under stones, 7 (N 18).
St. 39. 25. iii. 26. OTL, 179–235 m. 2 (N 44); N 4–T, 20 (N 23, N 93, N 112).
St. 123. 15. xii. 26. OTL, 230–250 m. 1 (N 18).

The lengths and corresponding breadths were: 30·0, 0·7 mm.; 90·0, 0·8 mm.; 22·0, 0·7 mm.; 53·0, 1·3 mm.

The body is thin, soft and round in section, tapering at the head and tail. The head is pointed and there is no neck between it and the body. There is a chevron groove behind the head, complete ventrally. The eyespots are arranged in four groups at the corners of a rectangle, the number in each group varying from one to six, the anterior groups usually containing more than the posterior. The colour is light yellow or yellowish red. The gut can usually be seen through the body wall. In the specimens which were separated as N 44 the vascular system was more engorged than usual and no eyes were seen (Plate XVI, fig. 23), but they were identified with the other forms from the sections.

Form and colour of spirit specimens. The body is contracted and cylindrical (lengths 18 and 15 mm. with breadths of 1·4 and 1·0 mm.). All colour is bleached and no eyes are visible. On clearing in cedar oil one specimen possessed the usual two pairs of eyes imperfectly formed, another had four large eyes and several small perfect brown cup-shaped eyes close to them. Two more variations are shown in Fig. 46. The proboscis is always small and thin. The armature consists of a main stylet 0·065 mm. long on a base 0·083 mm. and a curiously irregular accessory armature. One specimen had two accessory reservoirs, one with five stylets and the other, which appeared to be double, with five and six stylets. Another specimen had three stylets in each of two reservoirs and yet another had five reservoirs crowded together on one side of the main stylet each with four or five. I could not determine the nerves in the proboscis.

Fig. 46. *Tetrastemma esbenseni*, n.sp. Heads of two specimens cleared in cedar oil showing variation in eyespots.

Anatomy. The head glands open at a median ventral pit. They are very large, filling the head and persisting dorsally to the posterior end of the brain, ventrally farther back still.

The basement membrane is thick, nearly as thick as the epithelium. It does not stain. The circular muscle layer is about half as thick as the basement membrane and the longitudinal layer about as thick as the epithelium but thicker ventrally.

The vascular system is well developed on the usual plan, but the vessels are much

dilated or very capacious and full of nucleated corpuscles. This appears to be a constant character of the species, though it does not always appear in life in the marked form shown in Plate XVI, fig. 23.

The cerebral organs are very small and far in front of the brain. The relative positions of the brain, cerebral organs, eyes and head glands can be seen in the graphic reconstruction (Fig. 47). The anterior caecum has no forward branches and lies far behind the brain. The brain is large, the dorsal ganglia being about equal in size to the ventral and continuing into the lateral nerves down the body.

I have not been able to identify this form with any known species although it approaches *T. belgicae*, Bürger, 1904*a*.

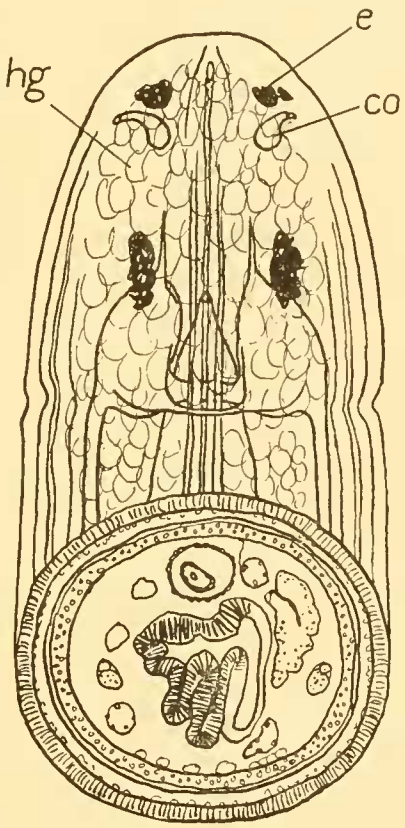

Fig. 47. *Tetrastemma esbenseni*, n.sp. Graphic reconstruction of the head and anterior end of the body. *co*, cerebral organ; *e*, anterior eye; *hg*, head glands.

Tetrastemma georgianum, Bürger, 1893 (Plate XVI, figs. 2, 13; Fig. 48).

This species was first noted from King Edward Cove. Two specimens were taken in September and four in October 1925, from kelp roots. A single specimen occurred at St. WS 65 in Undine Harbour. The smallest worm was 3·5 mm. long, but the usual length was from 10 to 15 mm., breadth 0·7 mm. The original sketch and description were made from six specimens (N 7). In 1929 a single specimen was collected in the dredge in King Edward Cove which was identified later with a larger form described under N 15, no differences being found in sections. The size attained may be 25·0 mm. Other captures were made—three specimens at St. 123, one at St. 140 and one at St. 51 (identified from sections, N 126).

Form and colour in life. The head is somewhat round in outline from above, but the snout has a median vertical cleft. The body is broadest at about half its length and is tubular and soft. The colour is brown, brownish red or mauve on the back, much paler beneath. With a low magnification (×10) the pigment appears granular. On the head the pigment band narrows and becomes defined so that the head appears to be bordered with white. On each side a white tag or strip passes up, while a little farther back the body colour is separated from that of the head by a fine white line which forms a wide V with the apex pointing back. I have never seen the anterior tags joined as a band. Four eyespots are present in two pairs. The first pair is situated at the anterior edge of the head pigment; the second lies within the white tags. A pair of vertical furrows which may be tinged with red can be seen in the tags.

Form and colour of preserved specimens. Length 9 and 13 mm., breadth 0·8 and

1·3 mm. respectively. The head is blunter than the tail and is marked off from the body by lateral opposite furrows and a complete circular chevron groove whose apex points back ventrally. No eyes are visible. The colour is usually bleached but may be yellowish.

Anatomy. The epithelium is thick. In one series of sections it was at the head almost twice as thick as the basement membrane, circular and longitudinal muscles together. Farther back on the body its relative thickness was less. I have some doubt of the value of comparative measurements of the epithelium and muscle layers, for another series shows a thick basement membrane not much stained, and a clear layer of circular muscles, the two together being about equal in thickness to the epithelium; it seems probable that bad fixation may be responsible for these differences.

The head gland is compact. It opens by a median pore at the tip of the head. There are three strands, one median dorsal and two lying laterally along the rhynchocoel. The former nearly reaches the dorsal commissure. The oesophagus opens into the rhynchodaeum near the snout and enlarges to the stomach just in advance of the brain. The anterior caecum sends forward two diverticula above the lateral nerves which overlap the posterior ends of the dorsal ganglia (Fig. 48), although the relative position of the branches and ganglia is altered by the state of contraction. The single excretory ducts open before the junction of the anterior caecum with the gut.

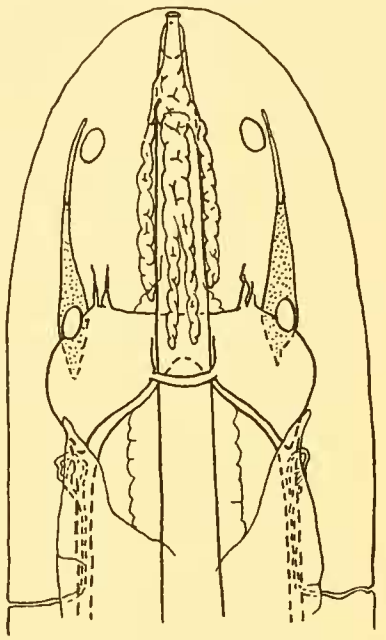

Fig. 48. *Tetrastemma georgianum*, Bürger. Graphic reconstruction of the head and anterior end of the body.

The proboscis is stout. The armature consists of a main stylet on a pear-shaped base larger than itself and two accessory reservoirs each with one or two stylets. There are ten nerves.

The ventral ganglia are a little larger than the dorsal. The cerebral canals appear as furrows on the ventral surface just in advance of the anterior pair of eyespots. They deepen and sink in. The organs join the dorsal ganglia from a ventro-lateral direction at the level of the ventral commissure (Fig. 48).

Tetrastemma gulliveri, Bürger, 1893 (Plate XVI, figs. 11, 17; Fig. 49).

This species was originally described and sketched at different times under the designations N 10 and N 14, but intermediate forms showed later that the differences lay in the size of the body and the distinctness of its markings. Subsequent investigation of the armature proved the identity. Thirty-four animals were examined in life, and from sections the following single specimen was sorted from the collection: St. 144, 5. i. 27, NCS–T, 155–178 m. (N 123). The lengths varied from 4 to 17 mm., the breadths from 0·6 to 1·6 mm.

Form and colour in life. The body is somewhat fusiform and in movement resembles *Oerstedia* in its semi-rigidity. The tail is more pointed than the head. Eyespots are visible in the smaller specimens. The colour is yellowish brown with a narrow median ventral pale "sole". The larger worms are darker and show less of the mottling—light irregular patches and dark spots—that is apparent in the smaller. There is a light ring circling the body at the back of the head, usually behind the second pair of eyespots but sometimes coincident with them. This pale annulation is characteristic of the species in life.

Form and colour of spirit specimens. Lengths 10 and 16 mm., breadths 0·7 and 1·4 mm. The body is nearly cylindrical, with the head thicker and blunter than the tail. There is sometimes a complete annular groove at the back of the head. The eyespots are not visible. The colour is usually completely bleached, but occasionally sufficient brown remains to display the white neck band. When cleared in anilin oil the pigment shows as black specks. The eyes, which are also rendered visible, are two pairs of brown cups, the concavity of the anterior pair being antero-lateral, that of the posterior pair postero-lateral. The eversible part of the proboscis is less than half the length of the body.

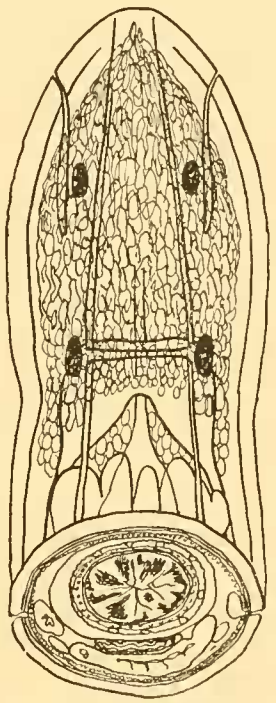

Fig. 49. *Tetrastemma gulliveri*, Bürger. Diagram from a graphic reconstruction of the head showing the eyes, brain, cerebral organs, and head glands.

Anatomy. The epithelium is very thick. The relative thickness of the body layers can be seen in Fig. 49. The head glands fill the head completely and extend back on all sides of the brain. Posteriorly they end dorsally with the dorsal ganglia, but they continue beneath the stomach and anterior caecum until the two forward diverticula of the latter join it. The diverticula almost reach the brain. The proboscis is well developed and possesses ten nerves. The armature consists of a slim main stylet on a rounded base and two reservoirs each with four, five or six stylets.

The dorsal ganglia are small for the size of the brain and the commissure is thin. The lateral nerves pass outwards and up from the ventral ganglia and they each carry down the body a strand of fibres from the dorsal ganglion. The cerebral organs are very small and thin. They open laterally not far from the head-gland pore and consist of a tube sheathed with large gland cells extending a short distance behind the first pair of eyes. The excretory ducts open far after the brain.

The specimens taken in King Edward Cove in 1929 and 1930 came from a small red alga. Three of these were found in mucous tubes attached to the weed. In 1929 four brown worms within mucous tubes had been found attached to the rootlets of kelp and described as N 50. On sectioning they proved to be *Tetrastemma gulliveri*. The epithelium was torn off and the internal organs degenerated, especially the brain. The

cerebral organs could be seen and the eyes and enormously developed head glands, though the latter did not stain as they had in the free specimens. The lateral nerves had degenerated considerably and the body consisted of a thin investment of basement membrane and muscles and a large amount of internal structureless substance in which the gut walls could still be recognized. No genital products could be seen. A specimen of *T. gulliveri* taken from red algae off the Point in King Edward Cove in March 1930 was full of eggs, so that there is evidence of a form of hibernation in this species.

Tetrastemma hansi, Bürger, 1893 (Plate XVI, figs. 6, 15; Fig. 50).

This species was first collected from the kelp roots in King Edward Cove in October 1925. Thirteen specimens were taken, sketched and noted (N 12). In March 1926 seven specimens differing in colour and body form were collected and described under N 17. These were later proved from their anatomy to be identical with the earlier forms. In April 1927 many specimens were collected of intermediate size and covering the range of colour. In November 1927 a specimen was taken that contained nearly ripe gonads visible through the ventral surface of the body.

Several small immature specimens were collected at St. 53 (Falkland Islands) and identified from sections (N 106).

Form and colour in life. The length and breadth rarely exceed 10·0 and 1·0 mm., though the breadth may be less for the same length. The body is round; the head just visibly marked from the body by its greater width. There are two lateral grooves on each side of the head and two pairs of eyespots. The head tapers to an acute snout. The colour varies from very light brown through shades of yellow-brown to light red and pink. There are sometimes traces of a pale median line down the back, not visible near the head and fading before the tail. Ventrally the animals are pale.

Form and colour of preserved specimens. The body is round in section, about 8 mm. long and 0·5 mm. broad. The head is blunter than the tail. The colour is completely bleached and the eyes are only visible faintly in the smallest specimens. On clearing the small proboscis can be seen not reaching to half the length of the body. The eyespots are very small.

Anatomy. The epithelium is very thick; the basement membrane and circular muscles very thin and equal in thickness. There are eosinophile gland cells beneath the longitudinal muscle layer ventral to the brain. The head glands are extremely developed though they do not stain with haematoxylin. They fill the head and stretch back beyond the brain and the two forward

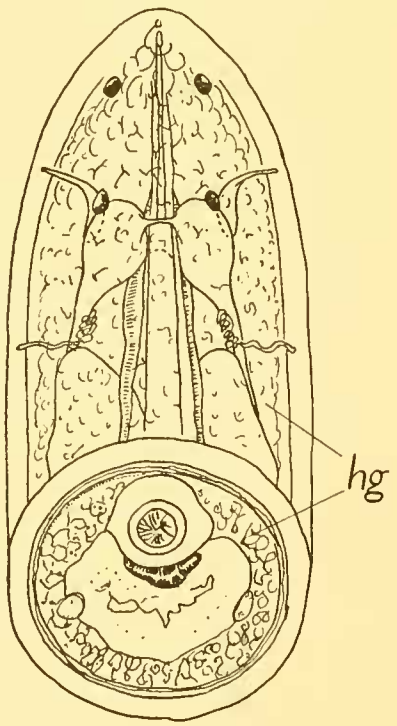

Fig. 50. *Tetrastemma hansi*, Bürger. Graphic reconstruction of the head. *hg*, head glands.

branches of the anterior caecum (Fig. 50). The nephridial tubules open to the exterior laterally at the level of the branches of the anterior caecum. The proboscis has ten nerves and is armed with the usual main stylet and two reservoirs each with two, three or four stylets. The brain is fairly large. The dorsal ganglia are smaller than the ventral and there is no strand of fibres from the former to the lateral nerves. The cerebral organs open ventro-laterally just in advance of the brain and pass inwards, increasing in size and becoming applied to the brain between the dorsal and ventral ganglia.

One of my sectioned specimens was an immature male, the other an immature female.

The identification of this form with *T. hansi*, Bürger, is based on the head glands and the cerebral organs. Both of my series of sections show two short lateral diverticula from the caecum.

Tetrastemma longistriatum, n.sp. (Plate XVI, fig. 7; Fig. 51).

This species occurred at the following stations. It was sketched and described under N 48:

St. 42. 1. iv. 26. OTL, 120–204 m. 2 (N 57).
St. 141. 29. xii. 26. BTS, 17–27 m. 2 (N 48).
St. 163. 17. ii. 27. BTS, 18–27 m. 1 (N 91).
11. iv. 27. Kelp roots, King Edward Cove, 2 (N 48).

The lengths and breadths of some of the specimens were: 10·0, 1·0 mm.; 5·0, 0·7 mm.; 5·0, 0·6 mm.; 2·0, 0·2 mm.

Form and colour in life. The body is round in section, tapering to the tail which is much more acute than the head. There is a pair of deeply embedded eyespots just in front of the head markings and another pair at the anterior end of the body pigment. The ground colour of the body is pale yellow. On the back there are two longitudinal brown bands, fading laterally, which leave a broad sharply defined streak between them. At the head the streaks end, but there is a pair of very deep reddish brown patches on the head in the form of two elongated right-angled triangles placed transversely, the right angles being the inner anterior angles.

Form and colour of preserved specimens. The length is about 5·0 mm., the breadth 0·35 mm. The body is cylindrical, the head blunter than the tail. The eyes are not visible, but on clearing, the anterior pair are larger than the posterior. The colour and markings are faintly seen.

Anatomy. The most noticeable feature of the species is the extreme development of the epithelium, which is at least twice the thickness of the remainder of the body wall. It bears within its cells large masses which stain with haematoxylin. The head glands are compact and solid masses opening just beneath the tip of the head. One strand spreads over the rhynchocoel, just reaching the brain. Another forms a thick U-shaped investment to the oesophagus but diminishes and disappears before the dorsal strand. The lateral branches of the anterior caecum overlap the dorsal ganglia (Fig. 51).

The proboscis is stout. I could not make out more than nine nerves in one of my series of sections, but there were ten in another. The armature consists of a main stylet with two reservoirs each with three stylets.

The brain is large, the dorsal ganglia being somewhat smaller than the ventral. There is no dorsal strand in the lateral nerves. The cerebral organs are small. They open laterally and only just reach the brain (Fig. 51).

Two small specimens from St. 42 were examined among the preserved material. One was sectioned and proved to be a female with large eggs. In all characters this specimen agreed with the above description.

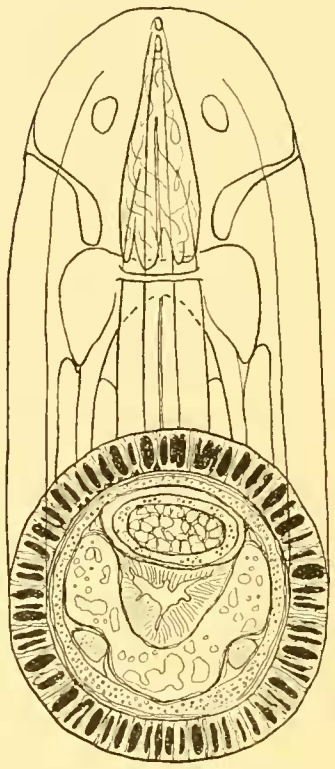

Fig. 51. *Tetrastemma longistriatum*, n.sp. Graphic reconstruction of the head and section across the body to show the extreme development of the epithelium.

Tetrastemma maivikenensis, n.sp. (Plate XVI, fig. 10).

Only the external characters of a single specimen (N 19) of this worm are known, and it bears a resemblance (except in size) to *T. vermiculus*, Quatrefages. The length in life was 40 mm., the breadth 0·75 mm. The body was soft and round, tapering to the tail. There were two pairs of eyes and the brain could be seen as a bilobed pinkish mass through the body wall. The colour was pale green except at the head which was yellowish. The distinctive marking consisted of a streak of brown pigment between the eyes of each side.

It takes its name from Maiviken, South Georgia, where the specimen was found (St. MS 70).

Tetrastemma stanleyi, n.sp. (Plate XVI, fig. 12).

Three specimens of this form were collected in Port Stanley harbour under stones at low tide on April 29, 1926 (N 21). The lengths ranged about 40·0 mm., the breadths 1·2 mm.

The body is round in section, the head slightly constricted from it, bluntly pointed and somewhat flattened. The tail tapers but ends acutely. There are from one to four eyespots in each group of the two pairs. The general colour effect is reddish brown near the head, paler towards the tail. One animal was olive green. The tip of the snout is conspicuously dark brown. This pigment is continued as a median line to the level of the posterior eyes between which it broadens and terminates. In spirit the colour is bleached. One specimen was of a dull bluish grey colour, evidently caused by the contents of the gut. No eyes could be seen even when cleared.

Anatomy. The head glands form a compact layer dorsal to the rhynchodaeum and disappear before the brain.

The epithelium is not very thick but it is equal to the three other body layers. Of

these the basement membrane and circular muscles are equal in thickness and are together about one-quarter of the thickness of the epithelium. The oesophagus opens into the stomach after the brain. There is no anterior caecum and the stomach is very long.

The proboscis has fourteen nerves. One specimen had an accessory armature of two reservoirs each with two stylets; another had two reservoirs each with four.

The brain is small and the dorsal ganglia do not send fibres into the lateral nerves. The cerebral organs are small and just reach the underside of the brain. The canals open ventro-laterally.

The specimen sectioned was an immature male.

Tetrastemma validum, Bürger, 1893 (Plate XVI, fig. 1; Figs. 52, 53).

In colour and especially in form this species is the most easily recognized of the southern *Tetrastemma*. Single specimens were taken from kelp roots in King Edward Cove in 1927 (N 49) and 1929. In March 1930 thirty-eight specimens were caught by the dredge with a mass of red algae. Other captures were at St. 175 (N 130) and St. 179 (eleven specimens—N 99). The lengths ranged from 8·5 and 10·0 mm. to 35·0 and 40·0 mm. with corresponding breadths of 0·8, 1·4, 2·5 and 2·3 mm.

The body is stoutly built, flattened from above and fusiform. The head is pointed, distinct from the body by a slight "neck". Cephalic grooves join under the head in a wide V with its apex forward and from this junction another groove runs forward in the mid-ventral line. There is a groove behind these at the shallow depression of the "neck", but this is incomplete dorsally. Sometimes the posterior part of the head is round and broad, the anterior end being drawn out into a kind of beak. It has a distinctly shark-like appearance, especially pronounced from the side. The colour on the back is dark reddish brown, yellow-brown or purple-brown. The underside is white. On each side of the head a very definite almost rectangular white tag shows up strongly against the dark pigment. Just before this tag there is an encroachment of white on the pigment of the head, and in this pigmentless patch lies the first pair of eyes. The second pair is situated behind on the anterior edges of the white patches.

Form and colour of preserved specimens. The body retains its shape to a great extent. The anterior end is blunter than the tail. The back is convex, the belly flat or concave. Very little colour remains in the specimens, but usually there is sufficient duskiness to make the white patches faintly visible.

Anatomy (Fig. 52). The head glands open near the tip of the head. There are at first three strands towards the dorsal side but they soon completely fill the head. At the anterior end of the brain the dorsal glands have coalesced, while ventrally there are still small packets. The glands do not stain with haematoxylin. After the brain they persist ventral to the branches of the anterior caecum. The epithelium is thicker than the sum thickness of the other layers.

The rhynchocoel extends to the end of the body and the nerves join just behind its attachment over the gut. The proboscis possesses ten nerves (in one specimen twelve) and has two accessory stylet reservoirs each with two stylets similar to the main stylet

which is 0·074 mm. long mounted on a pear-shaped base 0·101 mm. long. Branches of the anterior caecum do not reach the brain.

The brain is small. There is a dorsal strand in the lateral nerve. The cerebral organs are fairly large. They open on the under-surface of the head but do not reach the brain.

On two fronds of the red alga dredged with the large haul of this species a semi-

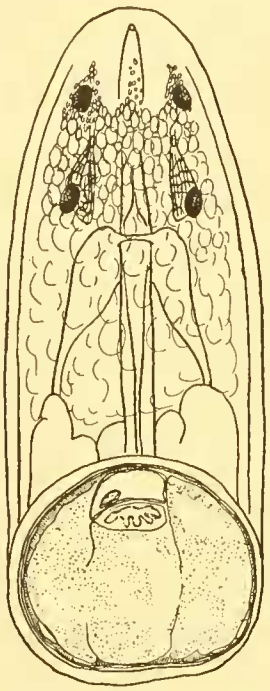

Fig. 52. *Tetrastemma validum*, Bürger. Graphic reconstruction of the head to show the development of the head glands and the position of the brain, cerebral organs, eyes and branches of the anterior caecum.

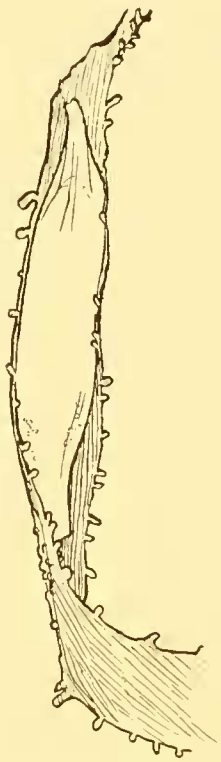

Fig. 53. *Tetrastemma validum*, Bürger. Membranous pouch, open at both ends, attached to a frond of red alga.

translucent sheath was found attached. The length was 28 mm., breadth 5·0 mm. The pouch was open at both ends and from one the animal crawled while under observation (Fig. 53).

In several characters this species is similar to *Amphiporus michaelseni*, Bürger, as described by Joubin (1908), but the four eyes and the internal structure show that its affinities are with *Tetrastemma*.

Tetrastemma weddelli, n.sp. (Figs. 54, 55).

One specimen (N 70) was collected at St. 160 between South Georgia and the South Orkney Islands. No note was made of the colour or form, but its anatomy is so distinctive that it should be easily recognized. The body was cylindrical, 11 mm. long and 0·75 mm. broad. The proboscis was protruded to a length of 5·5 mm. and just below it was the frilled opening of the mouth. The colour was bleached (Fig. 54A).

Anatomy. A feature of the sections throughout the body is the thickness of the basement membrane (Fig. 55) which is rather thicker than the epithelium. Both circular and longitudinal muscles are strongly developed. I could not be certain of the presence of head glands owing to the peculiar staining of the head, but there appears to be a thick strand staining deeply with haematoxylin dorsal to the rhynchocoel. The proboscis has fourteen nerves and is armed with a main stylet on an elongated pear-shaped base 0·098 mm. long and two reservoirs each with two stylets. The frilled mouth is a continuation of the stomach into which the narrow folded tube expands after the brain.

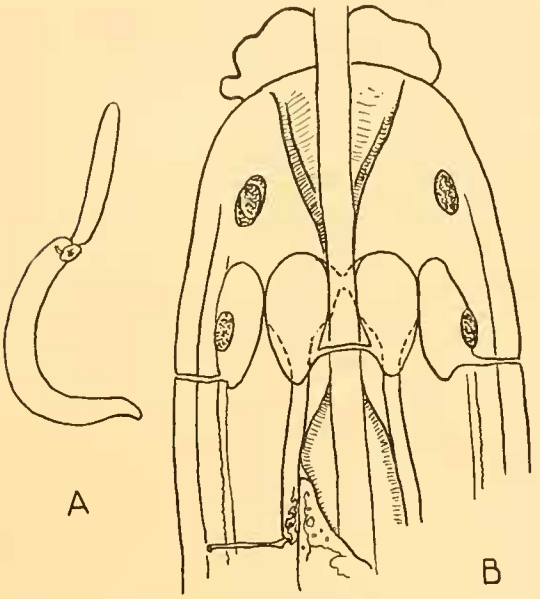

Fig. 54. *Tetrastemma weddelli*, n.sp. A, outline sketch of the preserved specimen, × 3 approx.; B, graphic reconstruction of the anterior end.

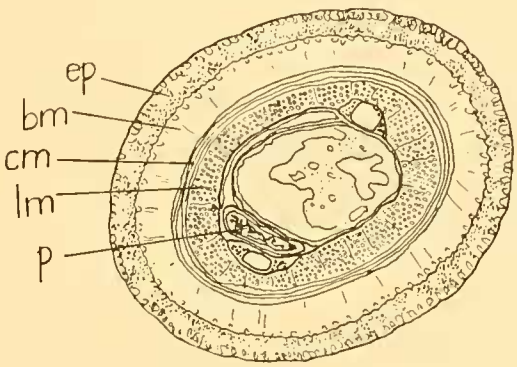

Fig. 55. *Tetrastemma weddelli*, n.sp. Transverse section across the body. *bm*, basement membrane; *cm*, circular muscles; *ep*, epithelium; *lm*, longitudinal muscles; *p*, proboscis.

There is a single forward diverticulum of the gut which is lateral to the stomach and does not reach the brain. The excretory tubules open dorso-laterally above the lateral nerves.

There are two pairs of eyes. In this specimen there is a double eye on one side. The brain is large and the dorsal ganglia are far larger than the ventral. The ganglia of each side are close together, especially the ventral ganglia at the anterior end (Fig. 54B), so that the ventral commissure is very short. There is a dorsal strand in the lateral nerves. The cerebral organs are large and lie along the dorsal ganglia. They open laterally from their posterior ends, though whether this is connected with the pushing forward of the alimentary canal or the normal position in life I am unable to say.

The specimen was a male with ripe sperm.

PART III. THE PELAGIC NEMERTEANS

Forty-five pelagic Nemerteans were included in the collection. Of these, thirty-five proved to be *Pelagonemertes rollestoni*, one of which, taken from a haul of seventeen at St. 107, was sketched in life. Most of the specimens were noted when captured but only one other colour sketch was made. This is reproduced in Plate XVI, fig. 5, and is a new species, *Bathynemertes hardyi*.

I have followed Brinkmann (1917) in his classification of the suborder Polystilifera, tribe Pelagica.

Genus Bathynemertes Brinkmann

Bathynemertes hardyi, n.sp. (Plate XVI, fig. 5; Figs. 56, 57).

This interesting form, curiously substantial for a pelagic worm, was sketched and noted in life by Mr (now Prof.) A. C. Hardy. It was captured at St. 86 (33° 25′ 00″ S, 6° 31′ 00″ E) in the $4\frac{1}{2}$ m. net at 1000 (–0) m. The body was scarlet with black irregular markings; the proboscis lighter than the body. The body was almost round in section, tapering a little to the head and considerably at the tail which was not expanded into a fin.

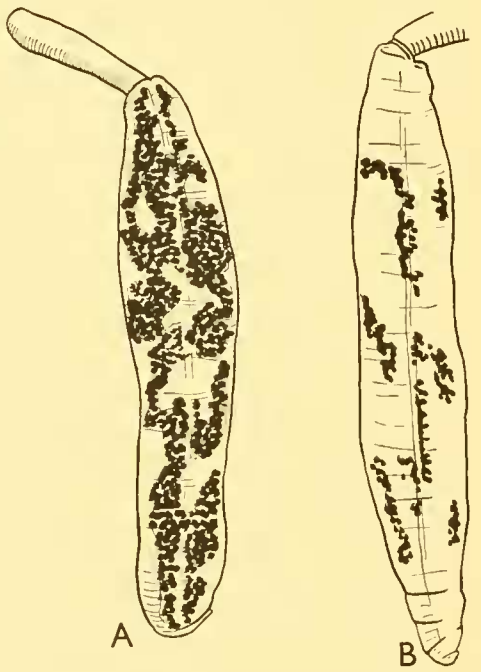

Fig. 56. *Bathynemertes hardyi*, n.sp. A, ventral, B, dorsal aspect of the preserved specimen. × $\frac{2}{3}$ approx.

Form and colour of preserved specimen. The body is 110 mm. long, with a maximum breadth and thickness of 25 and 13 mm. It is somewhat flattened and is faintly marked by narrow annular wrinkles. The tail is more definitely flattened. It has, however, neither fins nor lateral lappets. The body has a tendency to curl up at the ends due perhaps to the greater shrinkage of the proboscis and rhynchocoel wall towards the dorsal side of the body cavity (Fig. 56).

The mouth is not coincident with the rhynchodaeum and has a frilled edge. The proboscis is very strong. It is 8 mm. in diameter and covered with papillae. The rhynchocoel extends into the tail.

The body colour is light brown-orange with irregular patches of dark brown pigment especially on the under side. A lighter streak can be seen down the mid-dorsal and mid-ventral lines, and on each side there is a pale slightly raised lateral line breaking the pigment patches.

Anatomy (Fig. 57A). The epithelium is almost entirely absent; what there is being ventral (Fig. 57B). The basement layer is very thick and the circular and longitudinal muscles are fairly developed, little thinner laterally than dorsally or ventrally. Strong strands of muscle pass from the dorsal to the ventral body wall through the body.

The alimentary canal opens at the frilled mouth; there is no oesophagus. The branches of the gut are small but numerous anteriorly, and they reach forward to the brain.

The proboscis has twenty-four nerves and is armed by the usual curved rod, although no stylets could be seen. The rhynchocoel wall consists of interlaced longitudinal and circular

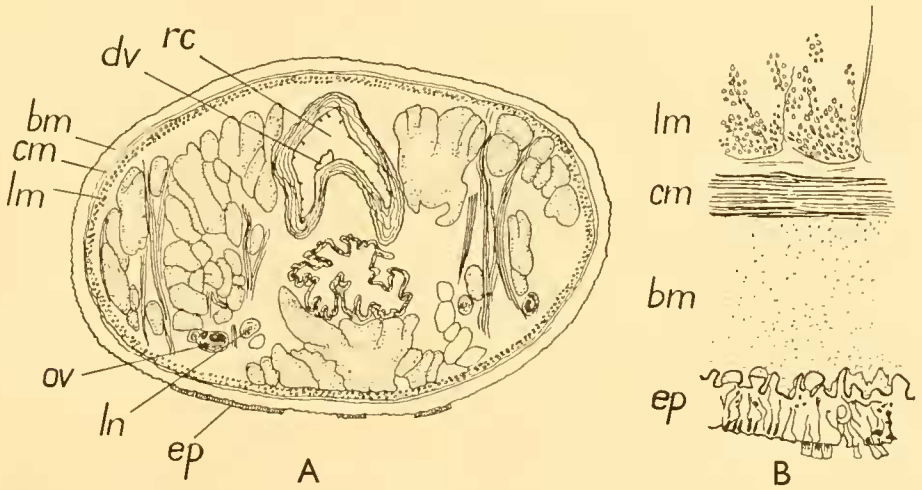

Fig. 57. *Bathynemertes hardyi*, n.sp. A, transverse section towards the anterior end of the body. *bm*, basement membrane; *cm*, circular muscle layer; *dv*, dorsal vessel; *ep*, epithelium; *lm*, longitudinal muscle layer; *ln*, lateral nerve; *ov*, gonad; *rc*, rhynchocoel. B, section of the body wall, from A, magnified.

fibres. The brain is not large. Its structure, with the strands of nerve fibres passing from the dorsal ganglia into the lateral nerves, corresponds with the description given by Brinkmann for *B. hubrechti*. I could find no dorsal nerve between basement membrane and circular muscles such as Bürger, 1907 (1912), describes in *Drepanophorus pelagicus*.

The specimen was a female with small eggs. The gonads were only seen towards the ventral side close to the lateral nerves.

Bathynemertes hubrechti, Brinkmann, 1917 (Figs. 58, 59).

Four specimens of fair size were collected at the stations given below:

St. 85. 23. vi. 26. 33° 07′ 40″ S, 4° 30′ 20″ E. N 450 H, 2000 (–0) m. "Scarlet" (N 168).
St. 89. 29. vi. 26. 34° 05′ 15″ S, 16° 00′ 45″ E. TYF, 1000 (–0) m. "Dull orange" (N 160).
St. 100*c*. 4. x. 26. 33° 20′ to 33° 46′ S, 15° 18′ to 15° 08′ E. TYF, 2500 (–0). "Bright brick red" (N 167).
St. 101. 15. x. 26. 33° 50′ to 34° 13′ S, 16° 04′ to 15° 49′ E. N 450, 1310–1410 m. "Orange red" (N 164).

The sizes in spirit were:

Serial No.	Length mm.	Greatest breadth mm.	Depth mm.
N 168	20·0	5·0	3·0
N 160	7·0	1·3	1·2
N 167	30·0	6·0	4·0
N 164	21·0	5·0	4·0

The form is flattened and bluntly pointed at both ends. Some degree of translucency may be observed but there is no colour (Fig. 58).

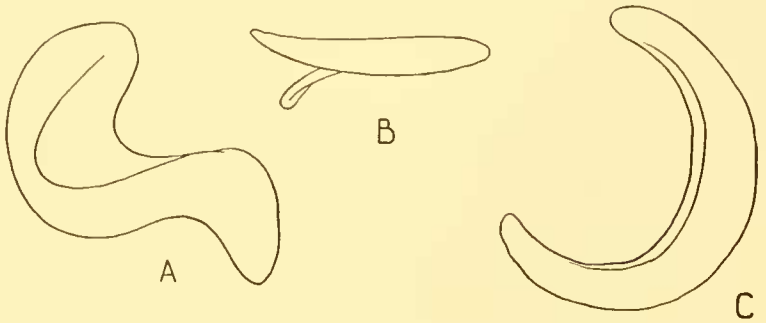

Fig. 58. *Bathynemertes hubrechti*, Brinkmann. Outline sketches of the preserved specimens. A, N 164 anterior end above; B, N 160 from the side; C, N 168 from the side.

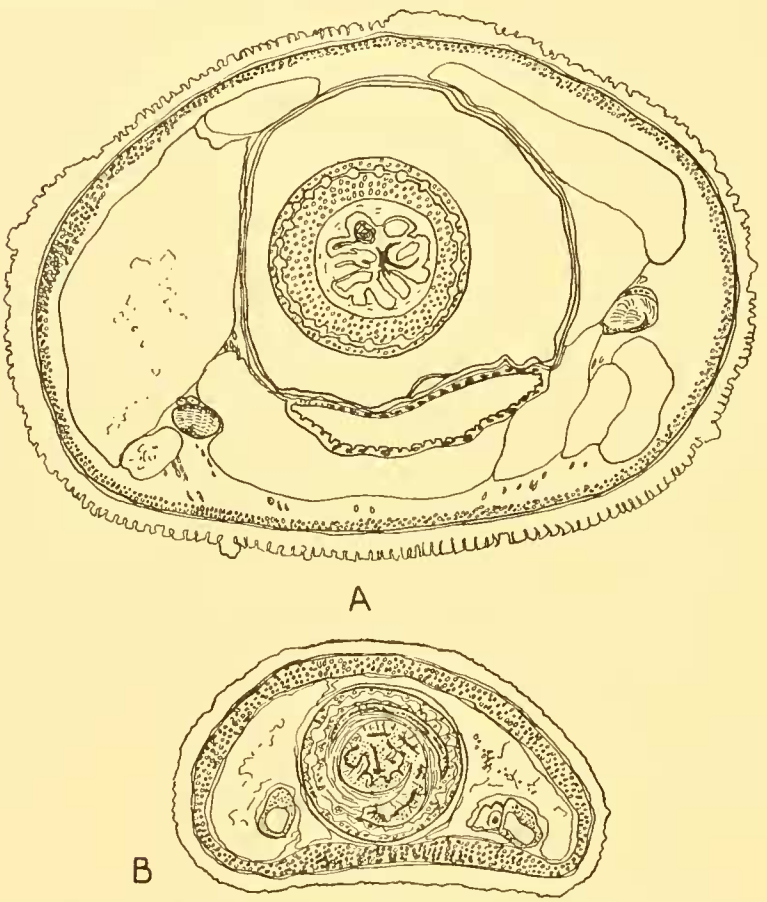

Fig. 59. *Bathynemertes hubrechti*, Brinkmann. A, transverse section through the body near the head (N 164); B, transverse section farther back (N 160).

Anatomy (Fig. 59). In all specimens the epithelium is missing. The basement membrane is high and serrated but not much stained. The musculature is reduced laterally and is thin dorsally and ventrally although it is thicker in the small specimen (N 160) than in the larger. There is no oesophagus. The gut branches fill the body cavity and the

lateral nerves are included among them and not pressed against the body wall. The rhynchocoel extends to the posterior end of the body. Its wall consists of interlaced fibres. The proboscis is very stout and the number of nerve strands varies between 22 (N 160), 24 (N 168), 25 (N 164) and 26 (N 167). The brain is of fair size and conforms to the description given by Brinkmann (1917).

N 160 and 164 were female. Small eggs could be seen close beside the lateral nerves (Fig. 59B). In the other specimens I could find no trace of gonads.

Genus Crassonemertes, Brinkmann

Crassonemertes robusta, Brinkmann, 1917 (Fig. 60).

No colour note was made of this specimen (N 170), taken with *Nectonemertes kempi* in a 2-metre net at lat. 6° 55′ N, 15° 54′ W, 0–800 m.

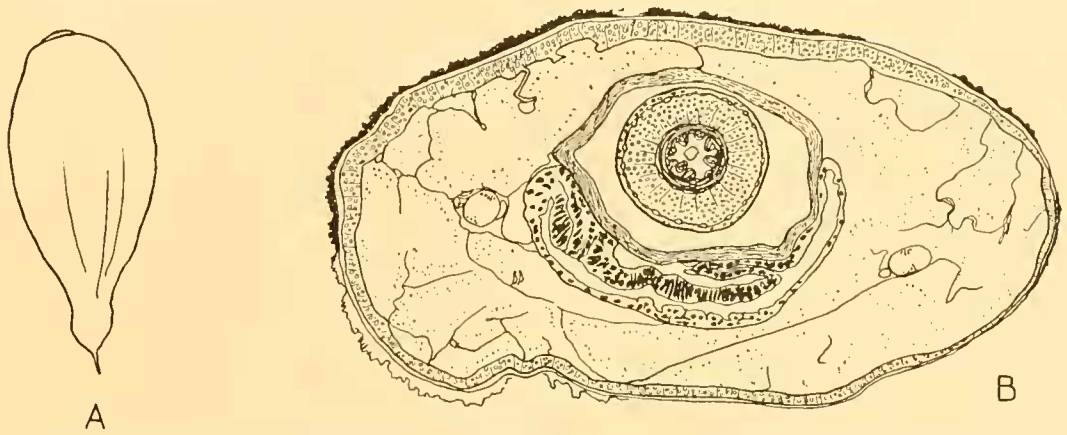

Fig. 60. *Crassonemertes robusta*, Brinkmann. A, dorsal surface, × 3; B, transverse section at the anterior end.

In spirit the body is white (it had been fixed in corrosive sublimate) and completely opaque. It is broad and flattened and has a distinct tail. A sharp end protruded from the tail; this was afterwards found to be the proboscis (Fig. 60A). The length is 15·0 mm., greatest breadth 7·0 mm., thickness 5·0 mm.

No epithelium is present. The basement layer is deeply stained and appears to have suffered from shrinkage or drying. The muscle layers are reduced, except dorsally (Fig. 60A). There is no oesophagus. The muscular stomach opens into the long pylorus at the brain. The gut branches are wide and very numerous. They fill the body cavity so that no sign of separate diverticula can be seen in the posterior part of the body when cleared with anilin oil.

The proboscis is very stout and long. It has twenty-one or twenty-two nerves. The wall of the rhynchocoel is composed of interlacing fibres. The brain is small. There does not appear to be a dorsal strand in the lateral nerves. No gonads could be made out.

Genus Nectonemertes, Verrill (part)

Nectonemertes mirabilis, Verrill, 1892 (Fig. 61).

A note was made that the colour in life of this specimen was "pinky red". It was taken at St. 87.

The length of the preserved specimen (N 80) was 14 mm., breadth 2·1 mm., thickness 1 mm. The colour was yellow and semi-transparent. The anatomy has been thoroughly described by previous workers. This specimen was a female with large eggs. The proboscis was missing. An outline sketch is given in Fig. 61 to show the form of the body and the position of the gonads.

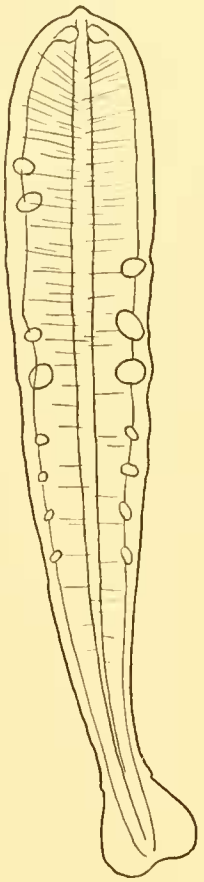

Fig. 61. *Nectonemertes mirabilis*, Verrill. Outline sketch showing the form of the body and the position of the gonads. × 7.

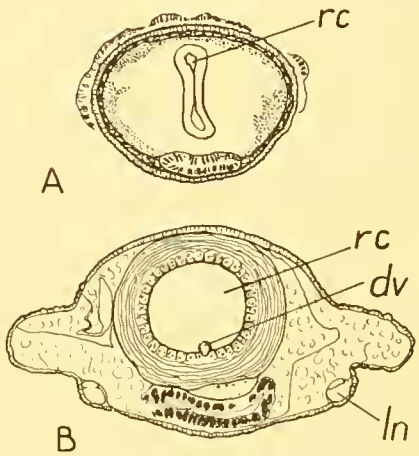

Fig. 62. *Nectonemertes kempi*, n.sp. A, transverse section through the brain. B, transverse section through the body. *dv*, dorsal vessel; *ln*, lateral nerve; *rc*, rhynchocoel.

Nectonemertes kempi, n.sp. (Fig. 62).

A small worm was collected with *Crassonemertes robusta* from 0–800 m. at 6° 55′ N, 15° 54′ W. It was fixed in corrosive sublimate. No note was made of the colour and form in life. The preserved specimen (N 169) was 7 mm. long and resembled the post-larval stage of a fish. It was white, somewhat flattened and had a tail fin.

The sections show a very large brain (Fig. 62 A) completely filling the head. It seems evident, however, that the specimen has suffered shrinkage from the fixative and this has probably affected the basement layer and muscles. The most striking feature apart from the size of the brain is the thickness and size of the rhynchocoel and its wall. The latter

is composed of an inner longitudinal layer definitely divided into bundles and an outer thick layer composed of circular fibres with some longitudinal fibres among them. Before the brain the muscle layers are reversed, i.e. the inner layer is circular and the outer longitudinal. The proboscis is missing.

There is no oesophagus. The branches of the gut reach forward beside the brain posteriorly.

The lateral nerves are pressed against the ventral body wall (Fig. 62 B) and contain an evident dorsal strand.

The specimen was a female with eggs developing singly close beside the larval nerves.

That the animal belongs to the genus *Nectonemertes* is certain from its form, the muscles of the rhynchocoel wall and the position of the lateral nerve cords. I have separated it from Brinkmann's species—*primitiva* and *minima*—on the ground of its form and the size of the rhynchocoel and brain.

Genus Pelagonemertes

Pelagonemertes rollestoni, Moseley, 1875 (Fig. 63).

The following captures were made of this species:

St. No.	Date	Gear	Depth	No. of specimens	Sex	Serial No.
—	2. ii. 25	N 200	0–800	1	♀	N 139
71	30. v. 26	N 70 V	1000–750	1	—	N 145
		TYF	2000 (–0)	1	♀	N 149
72	1. vi. 26	N 450	2000 (–0)	1	♀	N 141
76	5. vi. 26	N 450 H	1500–0	1	♂	N 147
78	12. vi. 26	TYF	1000 (–0)	3	♀♀?	N 143
79	13. vi. 26	N 450 H	1000–0	1	♀	N 140
85	23. vi. 26	N 450 H	2000 (–0)	1	♂	N 154
86	24. vi. 26	N 450 H	1000 (–0)	1	?	N 146
89	28. vi. 26	TYF	1000 (–0)	2	♂	N 158
					♂	N 163
107	4. xi. 26	N 450	850–950	17	9♀, 3♂	N 138
					♀	N 42
256	23. vi. 27	TYF	850–1100 (–0)	1	♀	N 151
395	13. v. 30	N 450 H	1500–1600	3	♂♂	—
405	4. vi. 30	TYFB	2200–0	1	♀	—

A specimen from the large haul at St. 107 was sketched directly after capture. An outline drawing of this sketch is given in Fig. 63 to which the imagination can readily add the transparency of the body, the opacity of the brain, lateral nerves, gonads, proboscis and its sheath, and the startlingly vivid colouring of yellow on red of the branches of the gut. This specimen measured in life 45 mm., and was 23 mm. broad. Another was 21 and 12 mm.

After fixation the gut branches appear considerably thicker than they are in life. The

variation in number of branches and in the size of the animal can be gauged from the following:

Length mm.	Breadth mm.	Thickness mm.	Gut branches
33·0	22·0	7·0	15 : 15
21·0	15·0	—	16 : 14
30·0	21·0	6·0	17 : 17
20·0	13·0	—	15 : 17
30·0	20·0	—	17 : 16
35·0	18·0	—	14 : 15
22·0	18·0	—	13 : 13
16·0	8·0	—	14 : 15
22·0	16·0	6·0	13 : 14
13·0	12·0	—	16 : 16

The anatomy of this species has been worked out very thoroughly by Bürger, 1907 (1912), and Brinkmann 1917. Fig. 63B shows the position of the testes and gives an

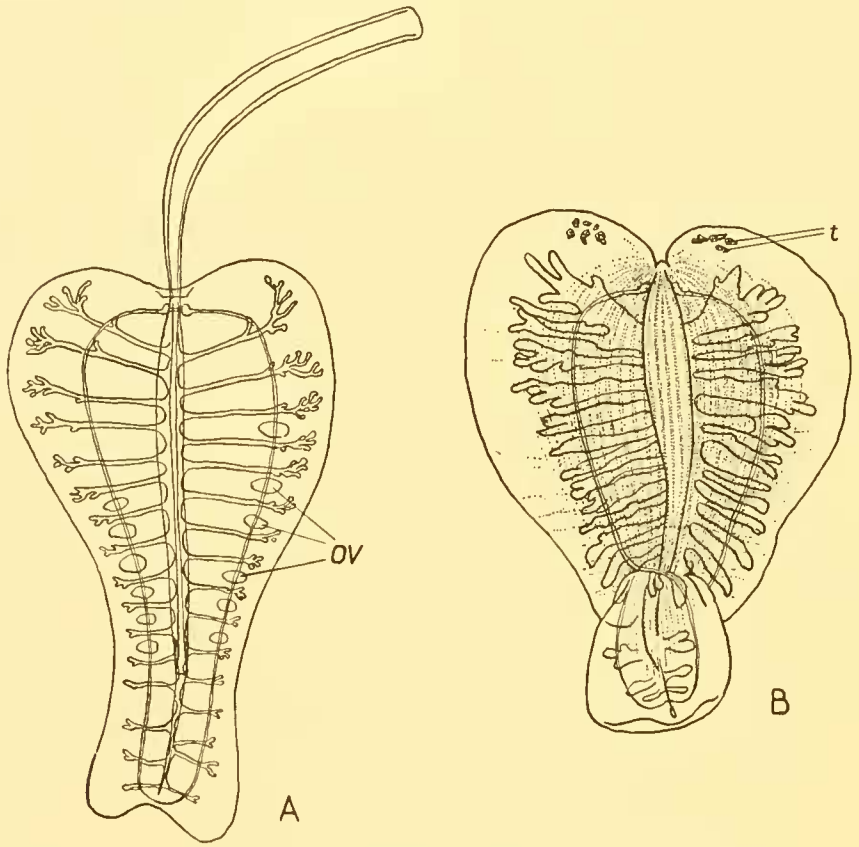

Fig. 63. *Pelagonemertes rollestoni*, Moseley. Outline sketches of entire animals. A, female, from a colour sketch of a living animal; B, male, from a spirit specimen. *ov*, ovaries; *t*, testes. × 2.

idea, when compared with Fig. 63A, of the degree of enlargement of the gut branches after fixation. The number of nerves in the proboscis was twenty-two in two of my specimens, but they are difficult to count because of the irregular thickening of the nerve

net. Brinkmann gives sixteen nerves. I have examined my series of sections for the rudimentary eyes and in two males several small organs corresponding to the description and figures (Brinkmann, 1917) were found on each side of the lappet of the body ventrally very close beside the rhynchodaeum, but I could not trace them in the female.

Genus Probalaenanemertes, Brinkmann

Probalaenanemertes irenae, n.sp. (Figs. 64, 65).

Two specimens of this form were collected at St. 89. The colour notes were "scarlet with orange spots down sides" (N 161); "pale orange with deep rose pink spots down sides" (N 162). In spirit the sizes were: length 9·0 and 17·0 mm.; greatest breadth 3·0, 3·5 mm.; thickness 1·7, 2·0 mm. Both were somewhat flattened, bluntly pointed at the thicker end of the body and with a distinctly flat spade-shaped tail (Fig. 64). In

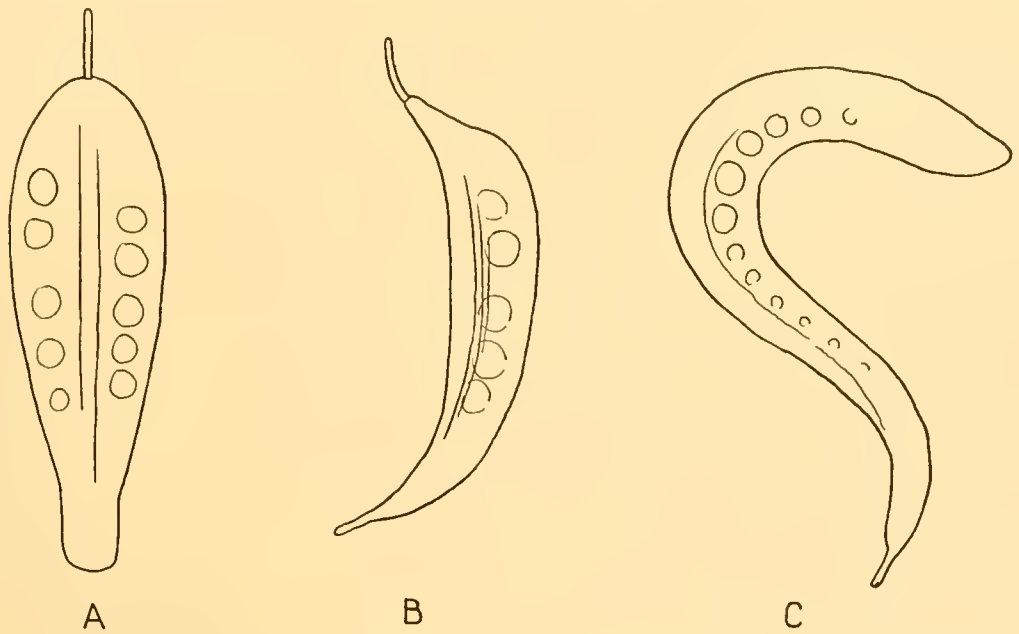

Fig. 64. *Probalaenanemertes irenae*, n.sp. Outline sketches of the preserved specimens. A, N 161, dorsal; B, lateral; C, N 162, lateral. × 4 approx.

one five brownish gonads could be seen on each side and the lateral nerves were faintly visible outside them; in the other there were fourteen gonads on one side, twelve on the other. The colour was pale brown and the bodies were translucent.

Anatomy (Fig. 65). The epithelium is present in patches at the anterior end and is a deep layer into which the serrated basement layer penetrates deeply (Fig. 65A). The circular and longitudinal muscles are very much reduced, especially the former. At the tail there are dorsal and ventral median strengthening strands of longitudinal muscle (Fig. 65C). There is no oesophagus. The folded tube shown in Fig. 65A passes back unbranched through the brain region and beyond. Meanwhile two gut branches have appeared above and lateral to the brain and farther back more appear which invade the

body cavity ventrally and finally open into a short median anterior caecum ending blindly forwards.

The rhynchocoel is spacious but the wall is thin. It is composed of inner longitudinal and outer circular muscles and extends nearly to the end of the body. The proboscis is thin and the muscles are poorly developed. It possesses seventeen nerves.

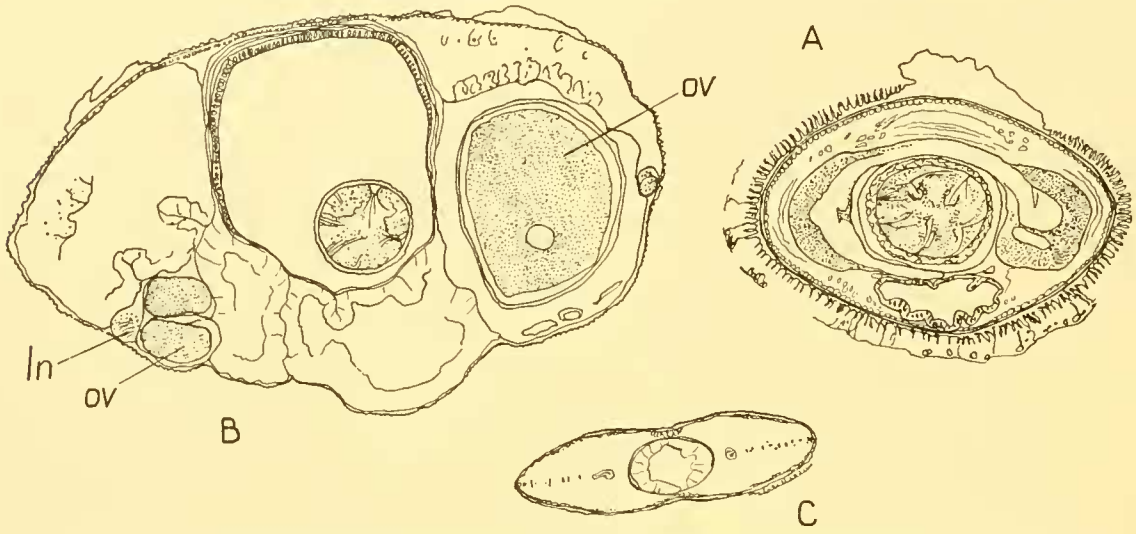

Fig. 65. *Probalaenanemertes irenae*, n.sp. Transverse sections. A, the region of the brain; B, mid-body; C, tail. *In*, lateral nerve; *ov*, egg.

The brain is fairly large, dorsal ganglia rather larger than ventral. The lateral nerves, containing a distinct mass of fibres from the dorsal ganglia, are pressed ventrally until they rest against the muscles of the body wall and close to them towards the middle line the gonads begin development. The eggs are immense (Fig. 65B).

NOTES ON THE DISTRIBUTION OF THE SOUTHERN NEMERTEANS

The extension of the Mediterranean fauna to the south western extremity of Africa has already been indicated. Certain species, of course, can be reckoned as cosmopolitan and their occurrence leads to no comment; for instance, *Lineus ruber*, *Tetrastemma candidum* and *Amphiporus pulcher*, which have been found widely distributed in the temperate seas in the northern hemisphere: but the inclusion of *Tubulanus nothus*, *Nemertopsis tenuis*, *Lineus bilineatus* and *Cerebratulus fuscus*—all easily identified by striking colour, markings or body form apart from their anatomy—points to a common origin with the fauna of the Mediterranean even if there is discontinuity across the equatorial region where at present the littoral fauna is not known. That more records are not available from southern waters is probably an expression of the relatively little systematic work that has been done south of the equator in comparison with the northern coast lines. *Amphiporus pulcher* has been recorded from Chili (Isler), *Tubulanus*

annulatus from the Cape of Good Hope (Stimpson) with *Tetrastemma candidum*, although the latter was described under the name *T. incisum*.

Dredging off the west coast of Africa was unfortunately not undertaken outside Saldanha Bay. I should expect *Baseodiscus delineatus* to appear in the collection notwithstanding its absence from the littoral fauna.

The material from South Georgia and the Falkland Islands consists of sub-Antarctic and Antarctic species peculiar to these regions; with representatives of the genera *Lineus*, *Cerebratulus*, *Amphiporus* and *Tetrastemma* in great diversity and numbers of individuals. The Paleonemertea are apparently not represented in the far south. Most of the forms taken are widespread or occur in the catches as isolated specimens from which no deduction as to distribution can be made. *Lineus longifissus* is an exception. This species was collected by H.M.S. 'Challenger' from a depth of 126 metres off Marion Island and described by Hubrecht from one complete and one fragmentary specimen. At St. 167 the R.R.S. 'Discovery' took this species again from a depth of 244–344 m. off Signy Island in the South Orkney group. This was perhaps the most curious haul made, for at this one station two nets attached to the back of the trawl produced between them twenty-five specimens. The same gear was used off South Georgia, the South Shetlands and the Falkland Islands, but no other specimen was captured. The only parallel instance that occurred among the Nemerteans was the haul of seventeen *Pelagonemertes rollestoni* in one haul of the $4\frac{1}{2}$ m. net at St. 107. *Pelagonemertes*, however, is a purely pelagic form, and swarming or "patchiness" in pelagic animals is a recognized phenomenon, not necessarily connected with breeding and sometimes on a large scale (as in *Euphausia superba*), so that the two hauls are not really comparable. What is interesting is the connection of Marion Island with the Antarctic by the occurrence of this species and of *Amphiporus marioni*, Hubrecht, now recorded from South Georgia, just as Kerguelen is linked by *Lineus corrugatus*, McIntosh, and *Amphiporus moseleyi*, Hubrecht, and both are separated from the northern continent by the dissimilarity in their Nemertean faunas. Coe (1905, p. 77) suggested that ocean currents with limiting climatic conditions are a factor, if not the factor, in the dispersal of Nemerteans in the Bering Sea. Applied to the data given above, however, dispersal by ocean currents does not seem a possible hypothesis, for it is difficult to understand how the current which passes up the coast of West Africa could have influenced the dispersal of the northern littoral forms to the southward, or, supposing dispersal took place in the opposite direction, why *Lineus corrugatus* has not become established on the West African coast with the help of the cold Benguela current. The facts indicate, I think, a creeping dispersal along an unbroken coastline, or at any rate a line of shallows with no extensive deep-water masses in the path of dispersal; and they suggest, in addition, that both Marion Island and Kerguelen were once more intimately connected with Antarctica than they now are.

The stations at which pelagic forms were captured are shown in Fig. 66. The most frequent capture was *Pelagonemertes rollestoni*, widely distributed in the South Atlantic and Indian Oceans and also ranging north of the Equator. *P. rollestoni* has always been

taken in deep-water nets, yet the depth at which it lives has not been definitely settled. We have now an observation with a closing net which indicates 850–950 m. between

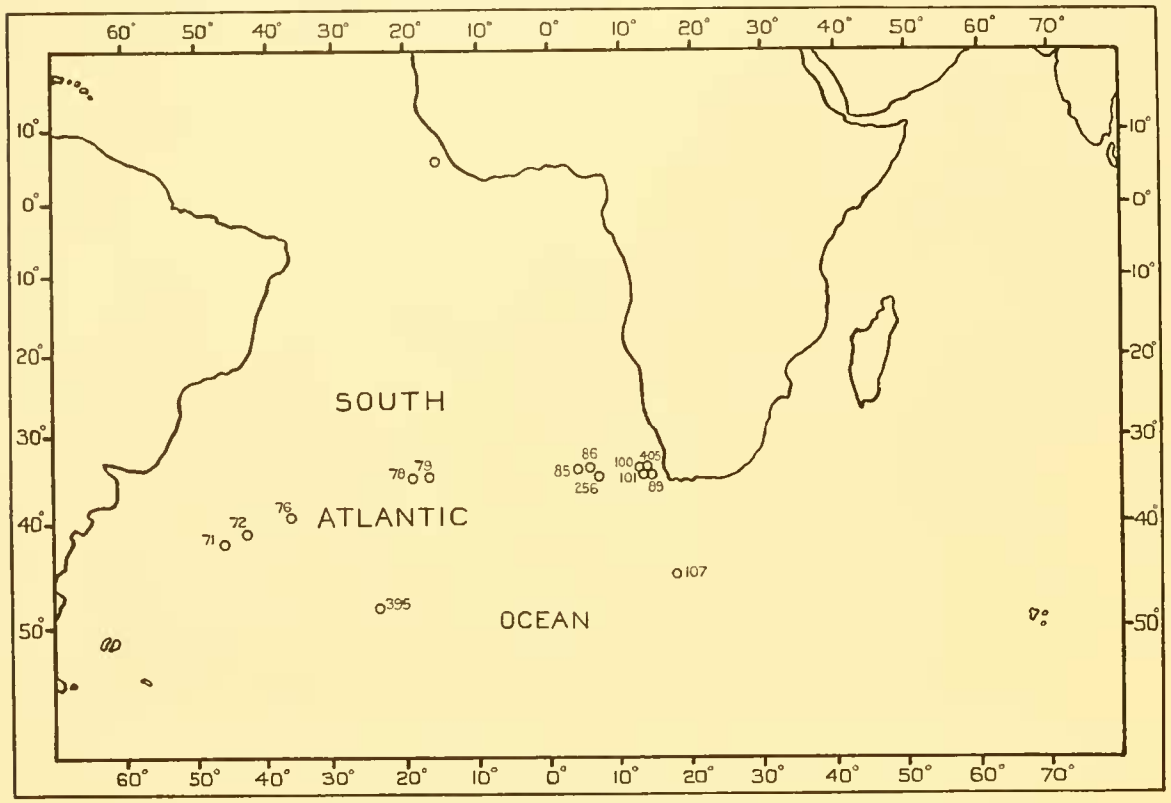

Fig. 66. Station positions at which pelagic Nemerteans were captured.

1 and 4 p.m.; another, at which only one specimen was captured, of 750–1000 m. between 10 and 11 a.m.; and a third of 1500–1600 m. between noon and 3.30 p.m.

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(*Synonyms are indicated by italics*)